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PIPE LINE INDUSTRY

SEPTEMBER
1960

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Maintenance—Special Report

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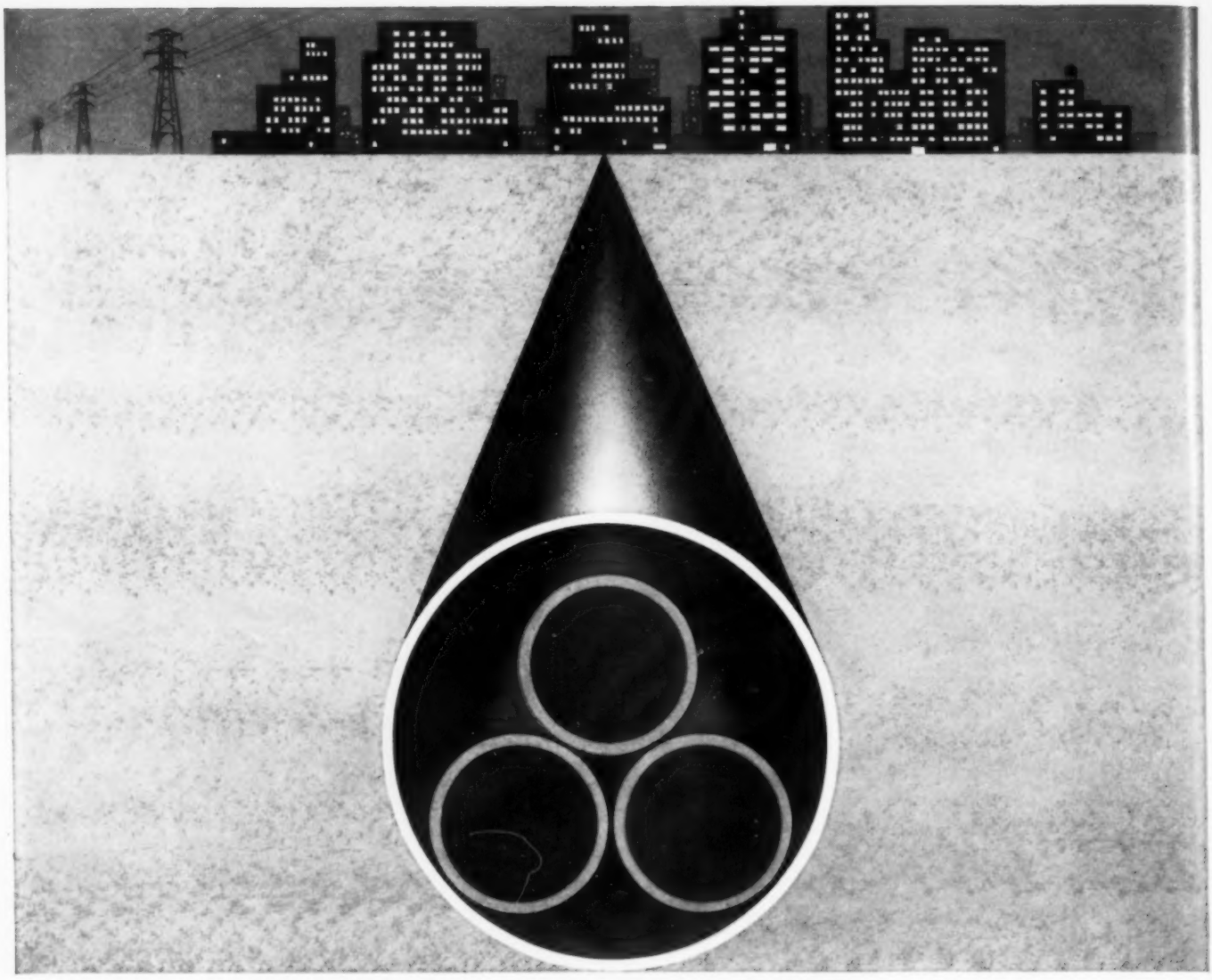

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Proved on-the-job—Allied Chemical *Job-Matched* Hotline Enamel's protective coating shields against the damaging effects of soil stress, internal electrical heat, and the corrosive effects of water and soil chemicals. Proved in laboratory tests—a one year immersion in salt water solution revealed high resistivity whereas *all* asphalt enamels showed very low resistivity. Proved in company balance sheets—not only is Allied Chemicals Hotline Enamel's initial expense far below asphalt mastic, it also repays itself over the years with worry-free protection.

Provides improved protection under these conditions:

1. On pipe type cables or "oil-o-static lines" subject to internal electrical heat. (Up to 180° F. down to –10° F.)
2. Warm, swampy areas or other places where excessive soil stress is encountered.
3. Areas where backfill and trenches are rough, rocky or contain foreign objects which penetrate softer coatings.
4. Hot gas pipelines, on discharge side of compressor stations where line is above 120° F.
5. Pipelines (such as heated fuel lines) where temperatures are consistently high most of the time.

Field Service Experts are at your call for technical assistance that can save you maintenance time and costs.

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Allied Chemical

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PIPE LINE INDUSTRY

A GULF PUBLISHING COMPANY PUBLICATION

September 1960 Vol. 13, No. 3

CONTENTS and Quick Look

To help you put first things first, scan these time-saving digests, checking √ those you want to read first.

MAINTENANCE REPORT

These Ideas and Inventions Can Make Maintenance Easier

☐ Eight different pipe line companies contributed to this feature which includes 18 top ideas. Save them to use in your own maintenance handbook. This feature is a tribute to the ingenuity of pipeliners.
By Donald M. Taylor.....Page 32

Ark-La Gas Completes Four Years Operation With Non-Lubricated Compressors

☐ With more than 100 compressor cylinders now operating without lubrication, Arkansas Louisiana Gas has proved that molybdenum disulfide impregnated rings and packing run cooler and with less wear. Lubrication costs and chores have been reduced at main-line stations, on booster units and wet field gas compressors. Recent inspection of 1,400-hp UTC compressor with 20,439 hours of non-lubricated operation showed wear of only 0.003 to 0.006 inches.
By P. J. Chandler.....Page 41

One Solution to a Scouring River

☐ To handle this foe of all underwater crossings, divers located the scours, pipeliners packed burlap bags of sand-cement mix under and around the pipe to form a triangular wall across the scoured out section. All told, Natural Gas Pipe Line Company pipeliners placed 17,615 bags in five scours at the eight-line crossings of the Mississippi River near Muscatine, Iowa.....Page 44

Reasons and Remedies for Crankshaft Failures

☐ Almost every company has been experiencing this difficulty in recent years, and not only are crank shaft failures costly—exceeding $50,000 per job in many cases—they cause loss of thruput while repairs are being made. Fortunately, crankshaft failures can be prevented in almost every instance. Much of the trouble comes when excessive crankshaft deflections occur, and often, this can be traced to foundation deterioration which comes during operations.
By F. E. Glendening.....Page 46

Sandblasting the Top of Full Crude Tanks Is Safe, If . . .

☐ Safety precautions were worked out and field tested by Service Pipe Line Co. Laboratory tests proved that it is static electricity—not heat or sparks from the sandblast—that caused the hazard. The solution is to ground all parts of the tank, equipment and the operator himself.
By Richard F. Gavitt.....Page 53

How Platte Whipped Its Double Tough Microwave Propagation Problem

☐ The company has 1,023 miles of microwave paths with more than 40 stations. When one fails, the system logs an outage. Over the years the company has solved most of the problems causing fading or failure. Here are the ideas that solved this difficult problem.
By James A. Brooks.....Page 56

Three Hard Speeches to Make

☐ Called upon for an impromptu speech would you "er" and "ah" and thoroughly embarrass yourself and your audience? Not if you know and use the formula presented in this article. There are also tips and suggestions on how to introduce other speakers and how to say "thank you" following their talks. You'll want to clip this article and save it for reference.
By George McWilliams.....Page 61

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Industry's Bright Spot . . . Gas Pipe Line Activity

DESPITE TALK about excessive refinery runs . . . imports problems . . . oversupplies of crude oil . . . rising costs and reduced profits in the oil and gas industry all is not black. Gas pipe line construction in 1960, and future plans, are at record levels. PIPE LINE INDUSTRY's recent survey of contractor activity thus far in 1960 shows that more than 15,000 miles of line has now been contracted or completed in current gas, oil and products pipe line projects.

The American Gas Association forecasts a bright future for the coming three years, too. AGA's statistical study just published, reports the "biggest construction push in the history of gas utility and pipe line companies is shaping up, with a record-breaking $2.23 billion being spent in 1960 for new plant and facilities."

The $23 billion gas industry, already ranked as the nation's fifth largest, is expected to add about a million customers a year to the 32.5 million now served. This year's construction outlay will top the previous record year of $1.772 billion in 1957 by 26 percent.

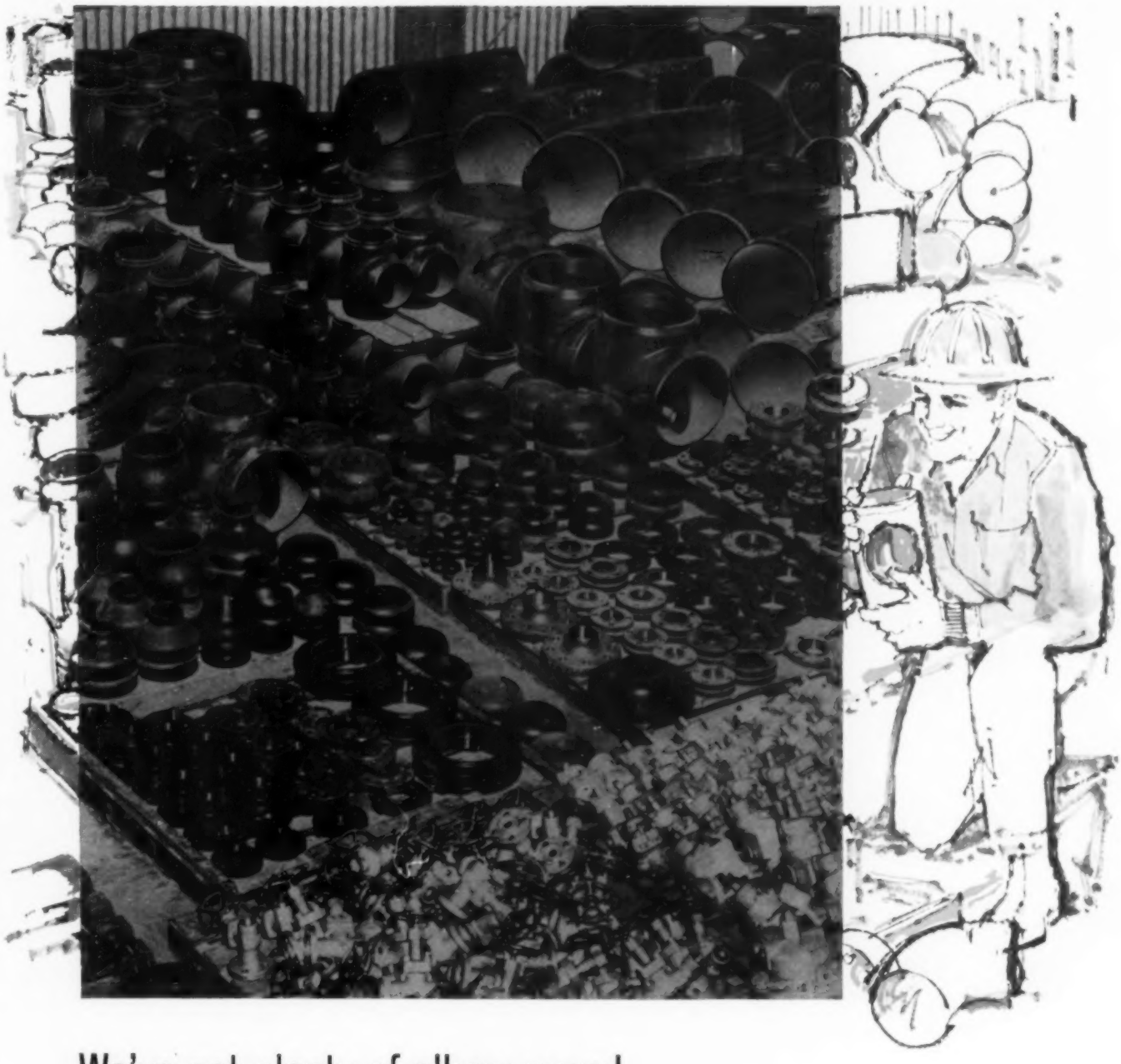
In forecasting the future, the AGA predicts that total 1960-63 utility and pipe line investments are estimated at $8.45 billion compared with actual outlays of $6.67 billion for the four-year period 1956-1959. These totals are broken down as follows:

	Forecast 1960-1963	Actual 1956-1959
Natural Gas . . .		
Production and storage	$1,122 million	$891 million
Transmission	3,455	2,858
Underground storage	466	271
Distribution	2,797	2,102
General	348	293
All other types of gas . . . production, storage, transmission and distribution	259	255
Total Industry Activity	**$8,447 million**	**$6,670 million**

These figures speak for themselves; although all forecasts have uncertainties and hazards, there is today a healthy, optomistic outlook throughout the gas industry.

The imagination of management plus the engineering and construction strides made by the industry have been the driving force behind this great growth. Such developments as the imaginative steps recently taken by gas pipe line companies to deliver more gas supplies economically with a minimum of regulatory fetters, increased interest in pipelining solids such as slurries coal or gilsonite, research toward gasification of coal and processing of shales and tar sands, coupled with the many engineering advances marked up by the pipe line companies, prove the industry's capacity to solve its future problems.

This year will see entrance of three more railroad companies into pipe line operations. It is especially significant that the industry has grown to the extent that it is no longer considered only an efficient and vital segment of the oil and gas industry but has become the largest, and most economical, transporter of energy and materials for processing.



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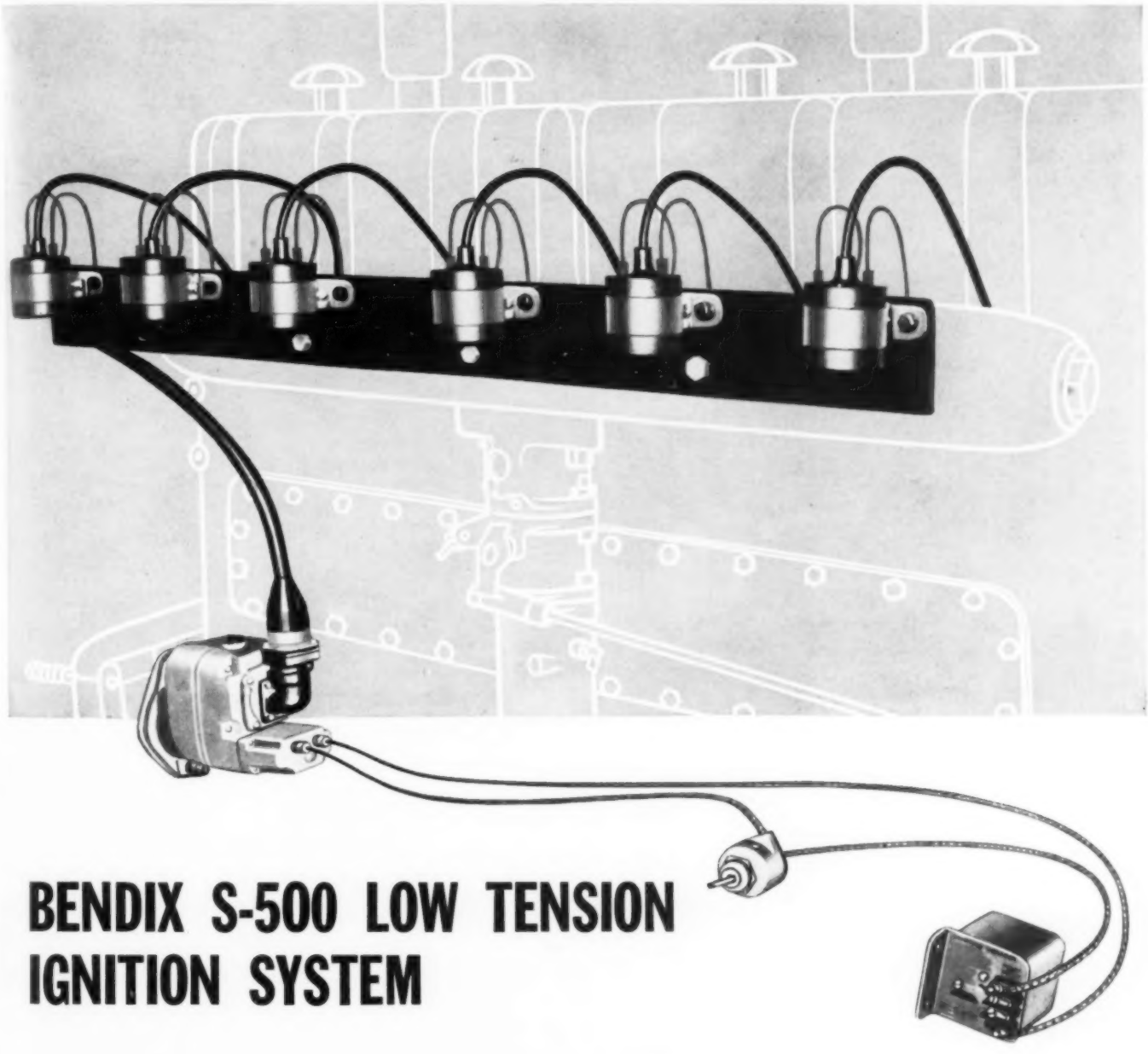

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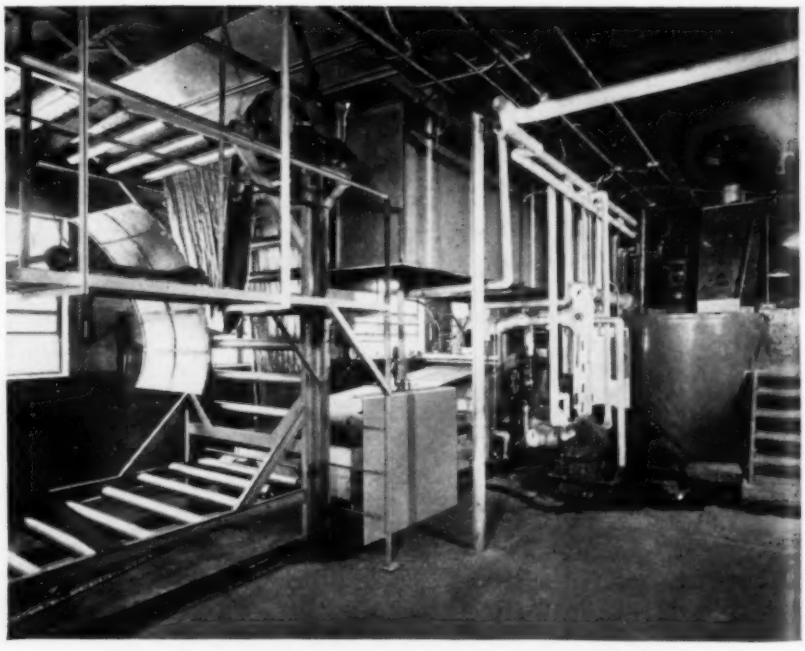

View of specially-designed machine developed after five years of research by Tapecoat engineers to convert raw materials automatically into TAPECOAT 20.

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Here where rock and tough conditions are the rule, the power shift transmission makes a tremendous difference. "This D8 is the greatest thing yet," continues Mr. Cook. "Power shift transmission sure gives the tractor plenty of get-up-and-go. Without a good means of checking we think very conservatively it has increased production at least 10-12%." And the operator adds, "Power shift takes the work out of operating—the machine practically runs itself. Even a twelve-hour shift doesn't tire me out."

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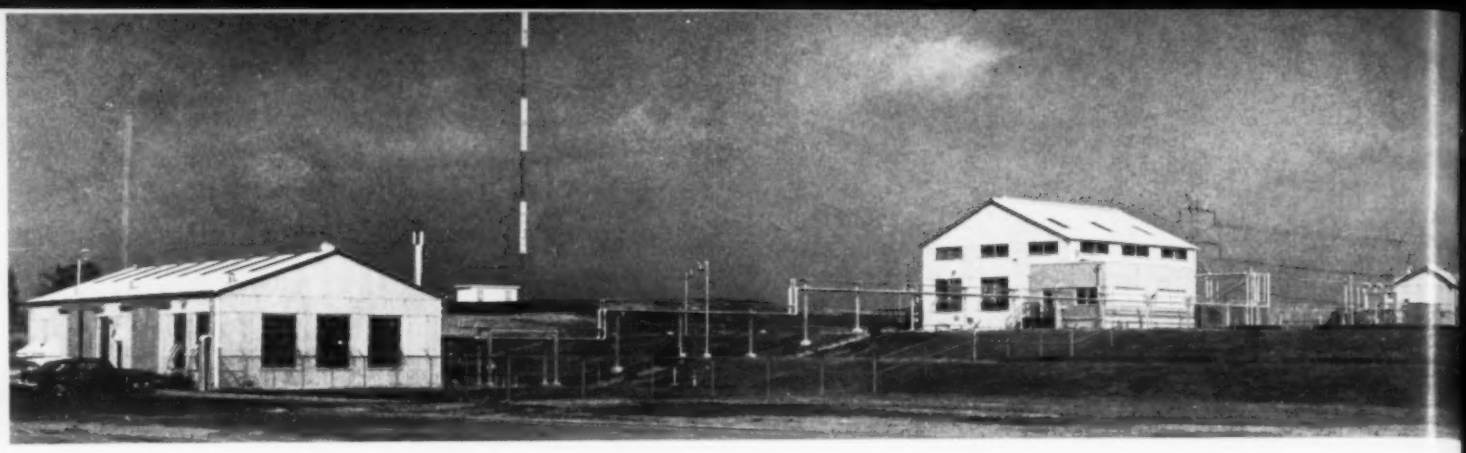
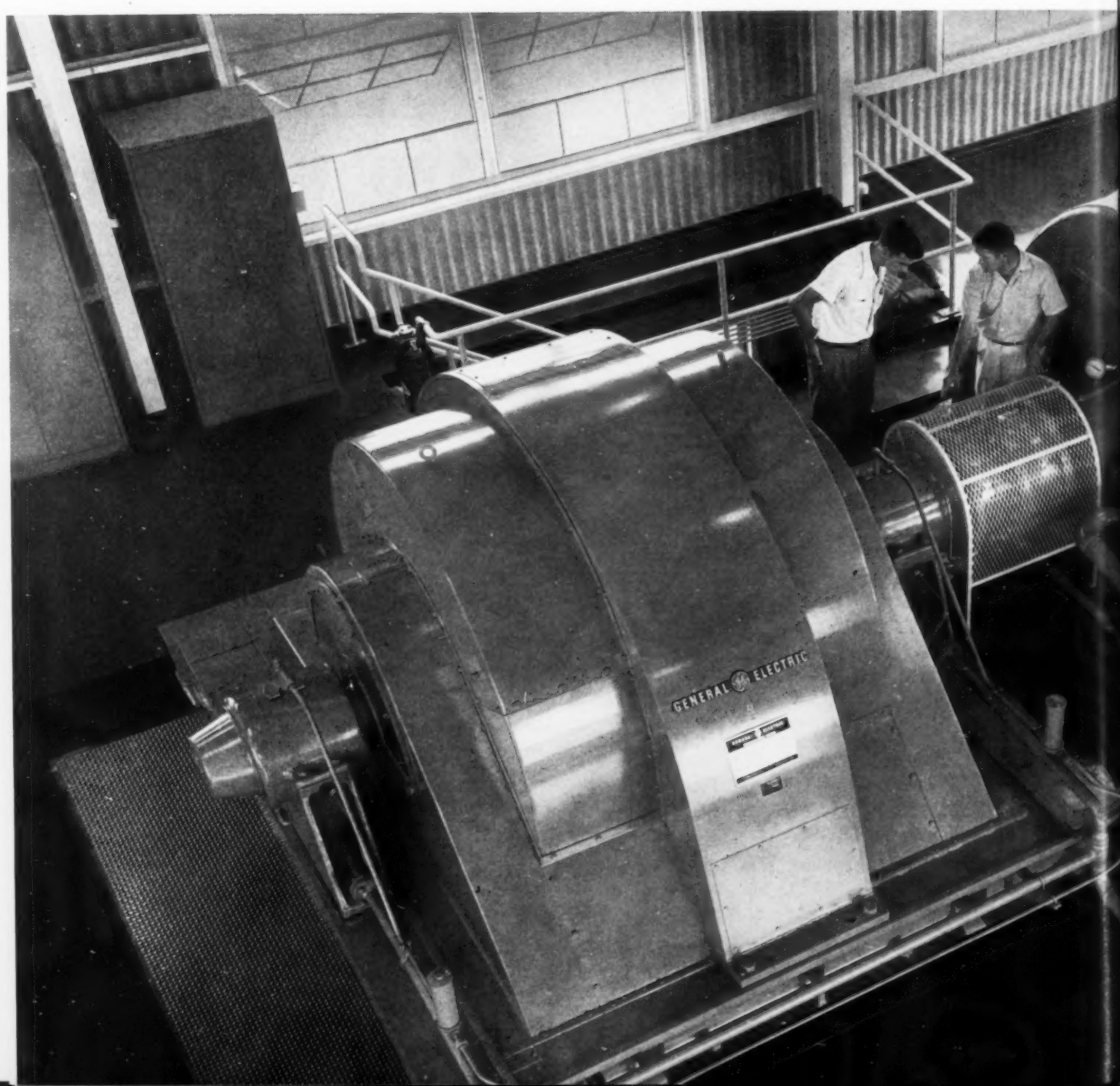
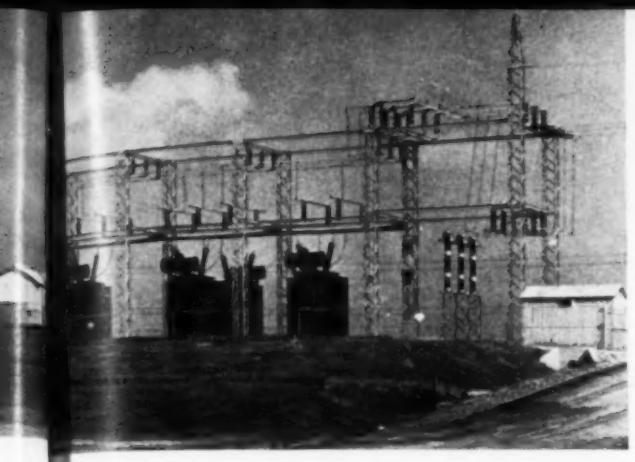
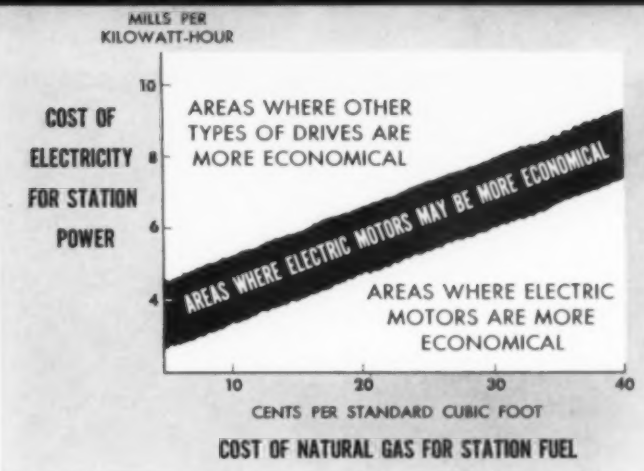


Before you select a pipeline







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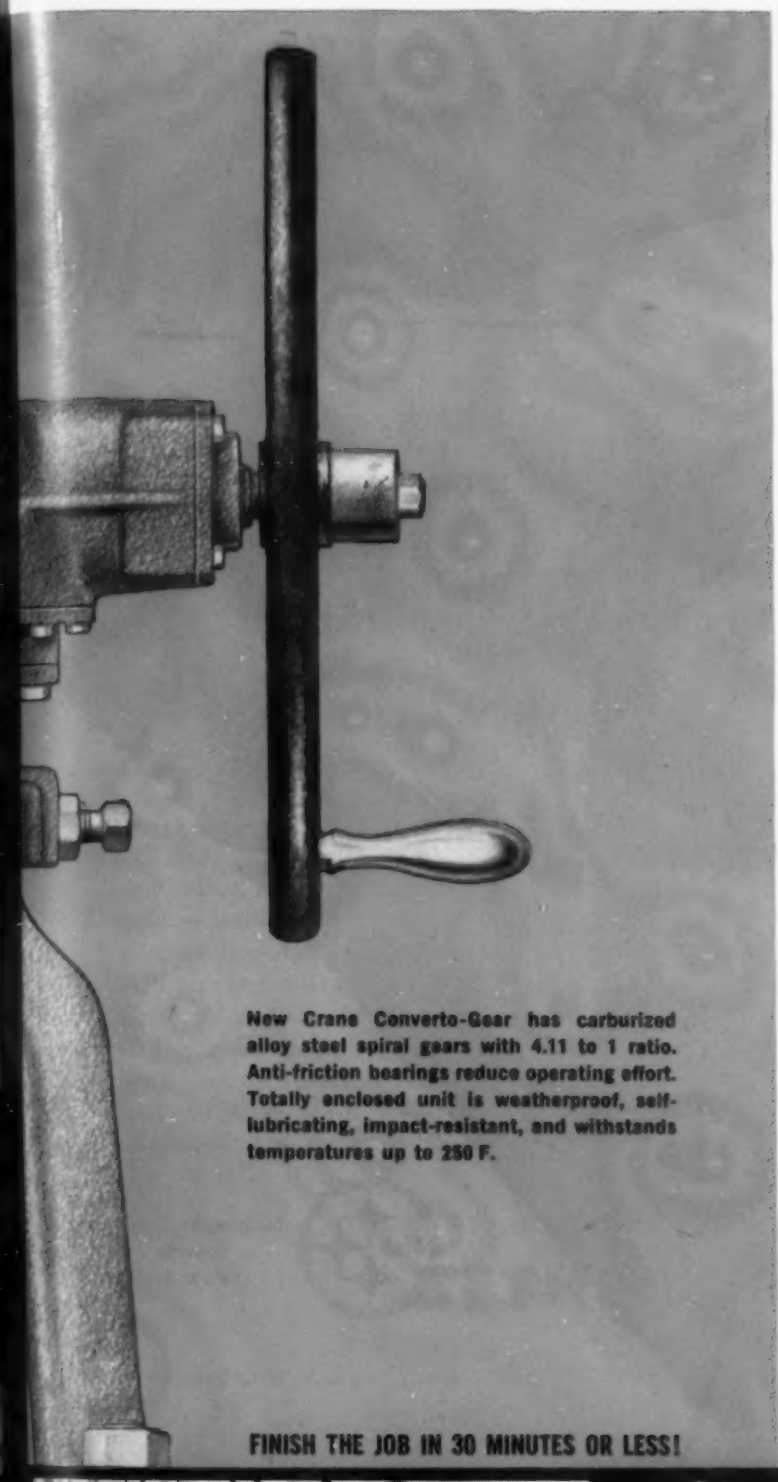

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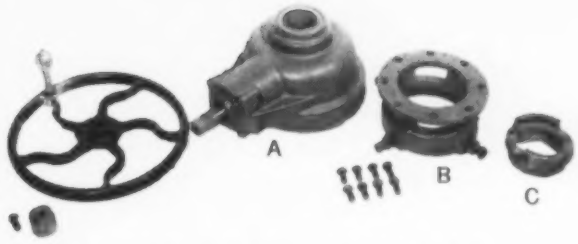

Only three parts needed to convert your OS & Y valve to gear operation: (a) Crane Converto-Gear Operator, (b) adapter for mounting operator on valve, (c) yoke sleeve adapter. Handwheel and mounting bolts furnished with conversion kit.

Now you can convert to rapid, easy gear operation on many of your Crane iron and steel gate valves without removing them from the line! Changeover is simple and fast with Crane's new Converto-Gear Operator.

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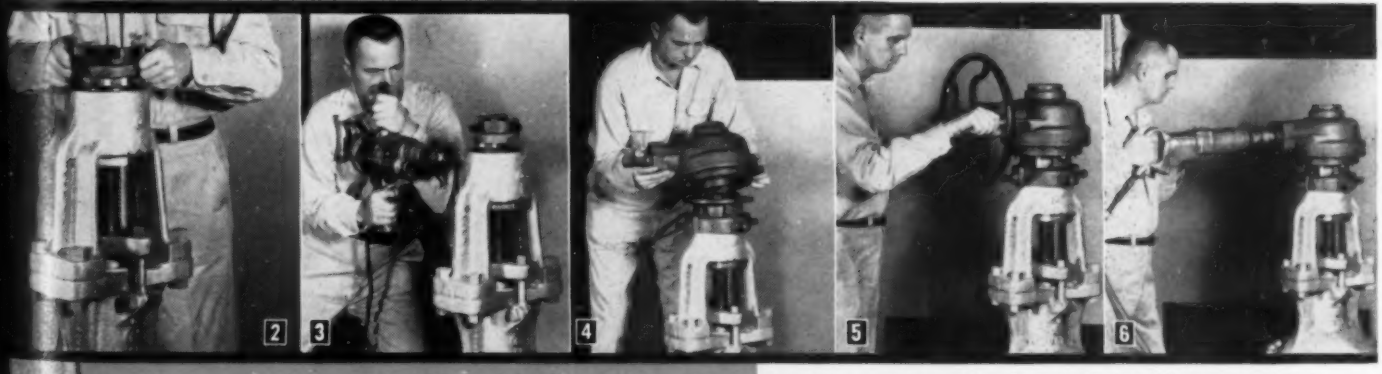

To convert your OS & Y valve, (1) remove the handwheel, (2) mount the yoke sleeve adapter, (3) countersink 4 holes for the Converto-Gear adapter, (4) bolt the adapter in place and attach your Crane Converto-Gear Operator, (5) and you're ready for smooth, manual operation, (6) or fast operation with an air or electric power operator.

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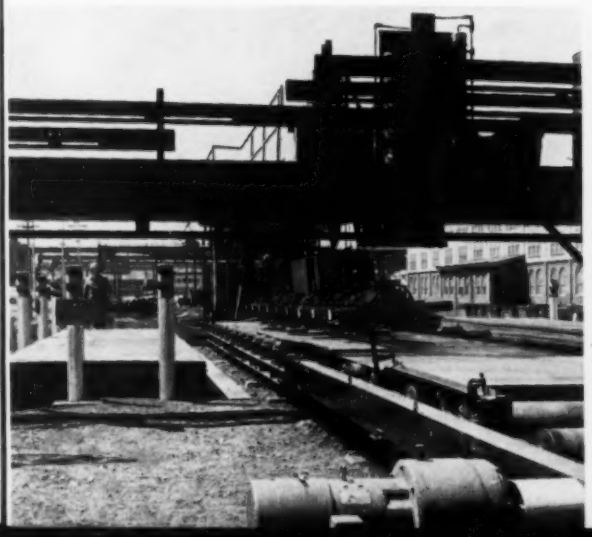
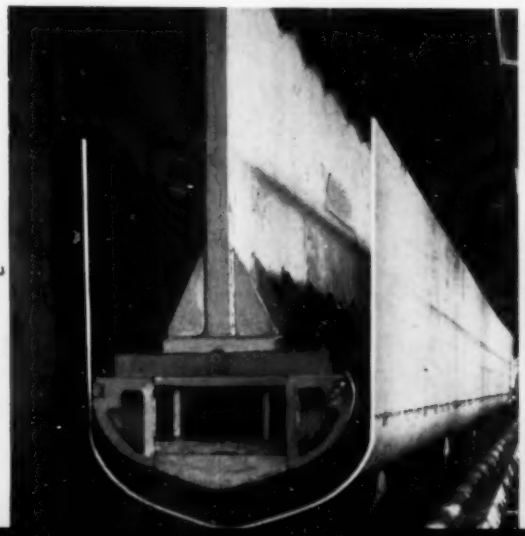
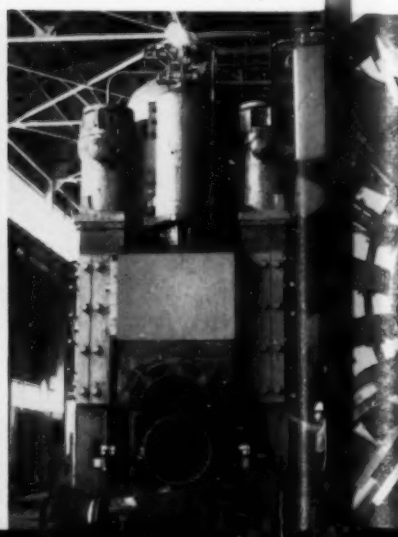
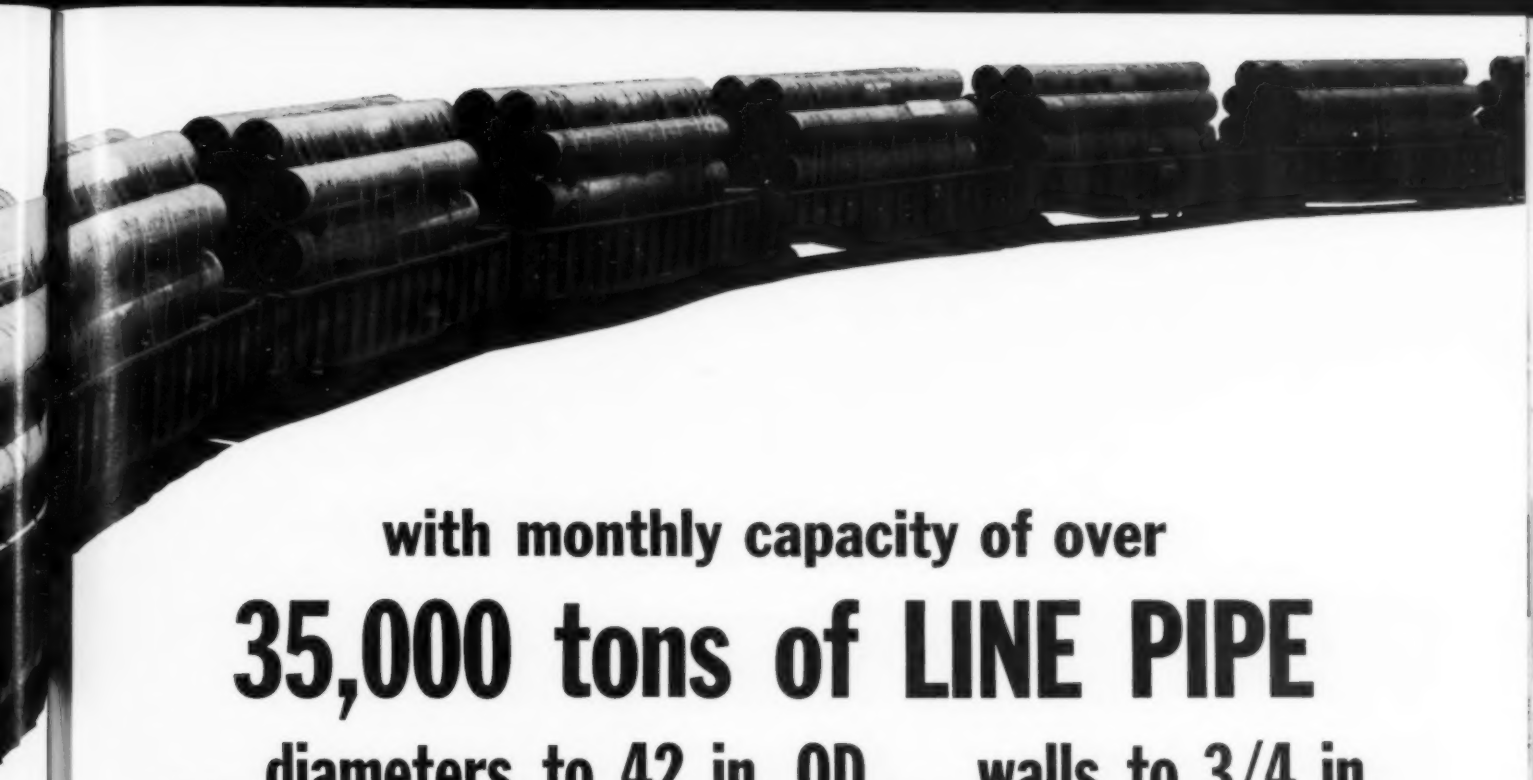


The prepared plates enter the U-ing press, where they are formed in a matter of seconds. Then . . .



into the mammoth, 18,000-ton-capacity hydraulic O-ing press. This machine can readily form plate ¾ in. thick.





with monthly capacity of over

35,000 tons of LINE PIPE

. . . diameters to 42 in. OD . . . walls to 3/4 in.

We're now turning out electric fusion-weld line pipe (18 in. to 42 in. OD) in 40 ft lengths on our new mill at Steelton, Pa. The most modern in the industry, it assures Bethlehem customers of a plentiful supply of pipe meeting API 5LX specifications, as well as non-API pipe in the largest diameters and wall thicknesses presently available anywhere.

The mill's facilities, most of which are equipped with electronic controls, includes newly installed edge and end planers, U-ing and O-ing presses, and welding machines. The only "old" production facilities remaining are the hydraulic pipe expander and the end facer—both installed in 1957.

With this new mill in operation, Bethlehem can meet your most demanding requirements for quality, delivery, and size. The Bethlehem sales office nearest you will give you prompt action on your inquiries.

Line pipe to 16 in. OD made at Sparrows Point, Md.—Our modern electric resistance-weld mill produces API line pipe from 5-9/16 through 16 in. OD, in lengths to 60 ft. We also produce continuous buttweld pipe from 1/2 through 4-1/2 in. OD.

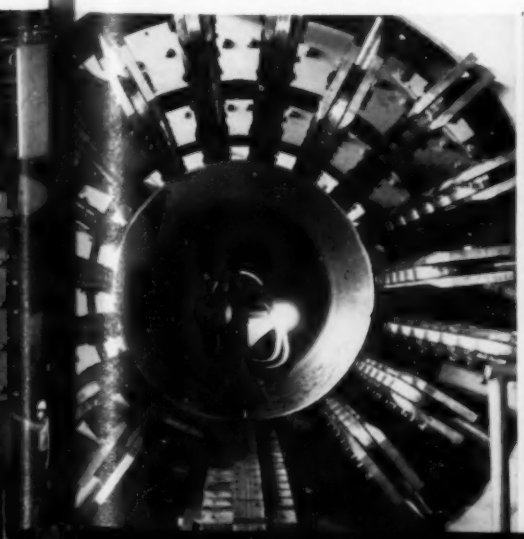
BETHLEHEM STEEL

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY, Bethlehem, Pa.

EXPORT DISTRIBUTOR: Bethlehem Steel Export Corporation

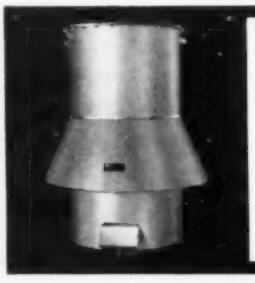
One of the automatic submerged-arc welding machines making an inside seam. Not shown are the outside welders.



After thorough visual inspection the 40-ft lengths are fed into the hydraulic expander. It can expand pipe 42 in. OD, with 3/4-in. walls.

After fluoroscopic inspection, the pipe is end-faced as shown here. This operation assures the proper bevel for field-welding.

NEW AAF Cycoil air cleaner has no moving parts!



HERE'S HOW IT WORKS—*Pneumatic oil lift delivers oil from reservoir at bottom of Cycoil to oil distribution plate. Source of lifting energy is the static pressure drop across perforated oil distribution plate, resulting in flow of air through plate when Cycoil is in operation.*

Now, an even more trouble-free engine and compressor air cleaner from AAF: the new Type P Cycoil!

Here's the *only* oil-bath air cleaner available which utilizes pneumatic lift, doing away with any need for oil pump and motor. And with pump and motor "designed out" there is nothing to lubricate, no brushes to replace, no circulator to wear out.

Just read these other "plus" features of the new Cycoil:

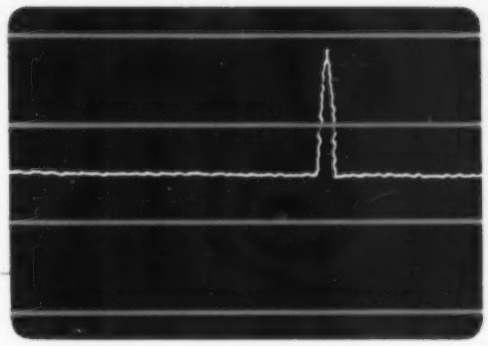
- **No wiring or on-site power needed; no problems of voltage rating, phase designation, or special protection for hazardous locations. No power bill to pay!**
- **Same low operating resistance and wide range of operation.**
- **Pneumatic oil lift a structural part of the inner Cycoil. No external piping or connections, with their possibility of oil leaks.**
- **Improved method of sludge removal.**
- **Shipped completely assembled. Just provide suitable supports and attach to air intake pipe!**
- ***Absolutely no sacrifice* in the quality of performance and construction which have characterized AAF's Cycoil line for 25 years.**

Interested? Get complete information from your nearest AAF representative, or write direct for Bulletin 160. Address: Mr. Robert Moore, American Air Filter Co., Inc., 450 Central Ave., Louisville, Ky.

AAF **American Air Filter**

BETTER AIR IS OUR BUSINESS

The Reflectoscope . . .



ANOTHER SAFEGUARD TO QUALITY IN

Acme-Newport ELECTRIC WELD LINE PIPE

The penetrating electronic eye of Reflectoscope is the latest of many safeguards to the quality of Acme-Newport line pipe. By scanning miles of pipe for possible defects not visible to the human eye, this unique device affords still another check of a score of processes that go before. Acme-Newport combines the most modern facilities and methods with 75 years of steel-making success, to become a most logical source for your electric weld line pipe, 4″ and 6″ sizes, standard or thin wall. For easy installation and long, uninterrupted service, make Acme-Newport your next buy.

SIZES AND WEIGHTS AVAILABLE

O.D.	Wall	Wt. Per Ft.
4½	.125″	5.84
	.142″	6.61
	.156″	7.25
	.188″	8.64
	.219″	10.00
	.237″	10.79
6⅝	.156″	10.78
	.188″	12.89
	.219″	14.97
	.250″	17.02
	.280″	18.97

Acme-Newport Steel COMPANY
NEWPORT, KENTUCKY
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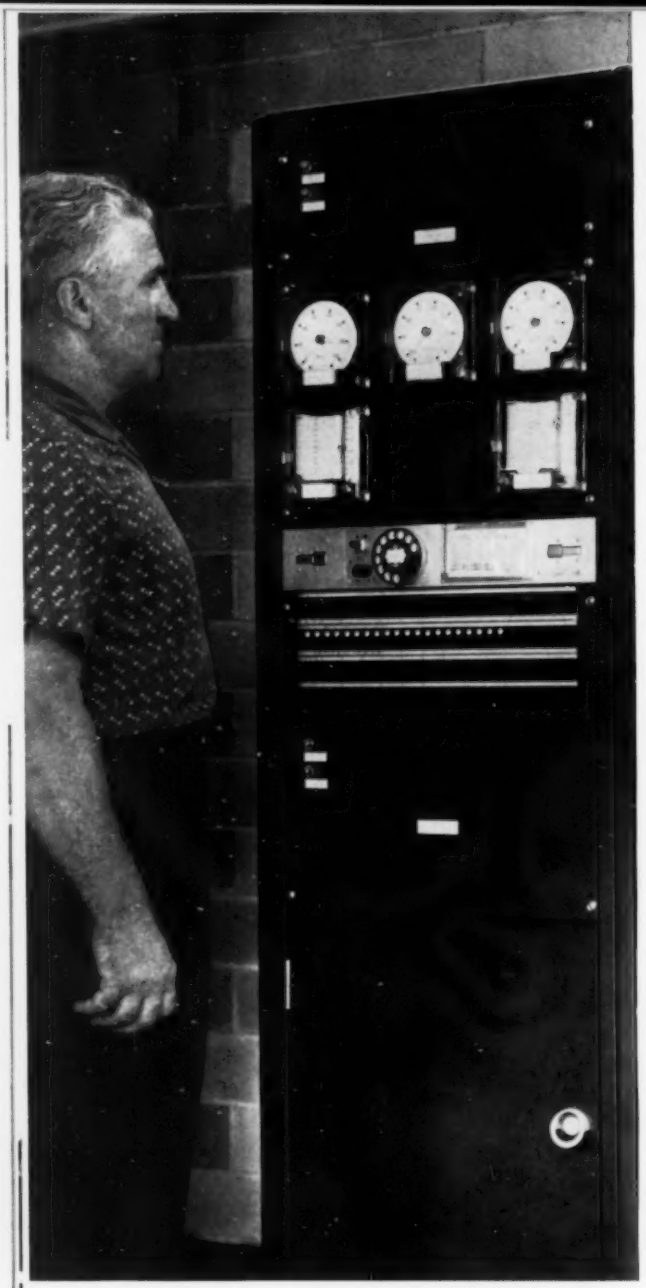
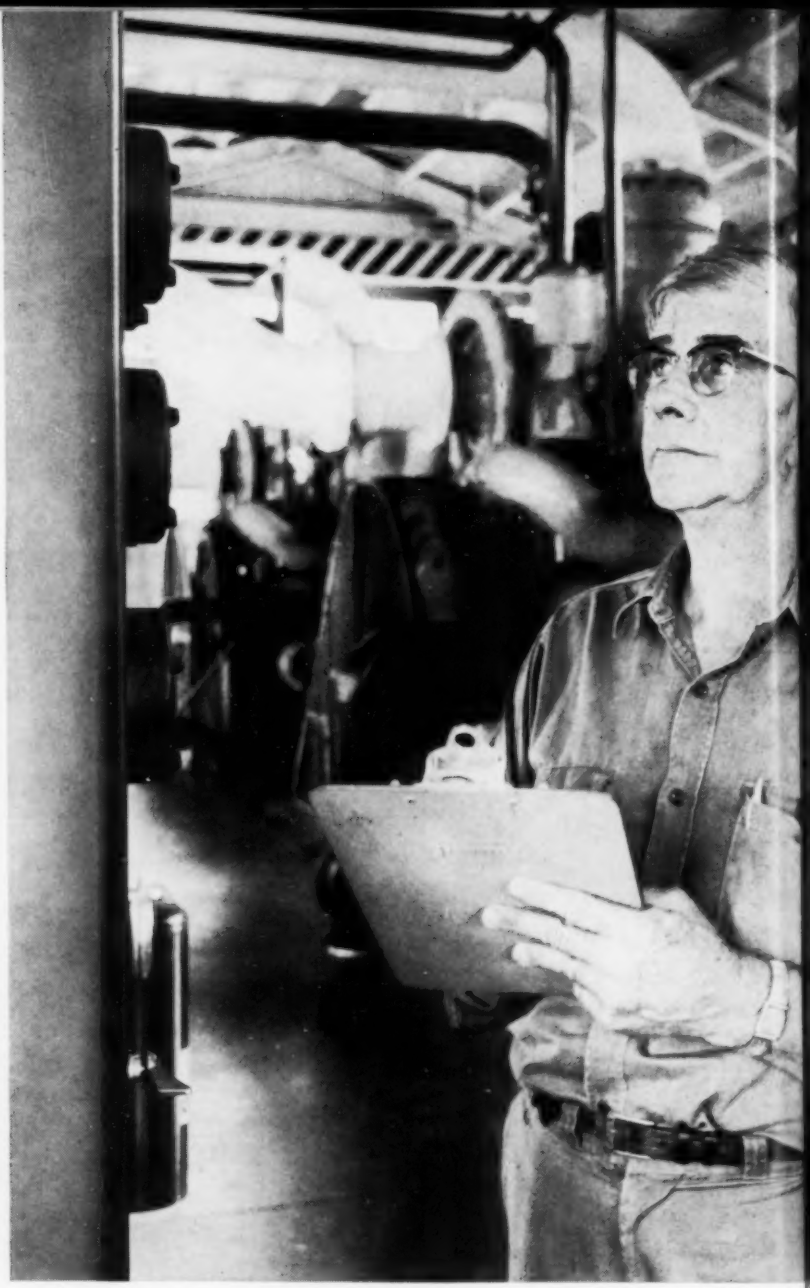


At Crawford Station: En-Tronic Control actuates all functions at McArthur Station and records engine speeds and pressures. Shown here: W. E. Deeds, Engineer in Charge.



At McArthur Station: James Caldwell, Chief Engineer takes a reading from the En-Tronic Control of one of the Cooper-Bessemer compressors. This control actuates starting sequences and monitors the complete operation.

How Cooper-Bessemer equipped McArthur St

TO START OR STOP McArthur Station's 1100 hp Cooper-Bessemer compressors, they simply dial a number. This storage field station of Ohio Fuel Gas Company is fully automatic, day and night... controlled from their Crawford Station 34 miles away by Cooper-Bessemer En-Tronic Controls. They start and stop the three GMVA Compressors... record engine rpm, discharge and suction pressures, and gas

At McArthur: This En-Tronic Control is a telemetering and supervisory control unit for the entire operation. Compressors can be started or stopped from this location as well as from Crawford.

Station operates automatically round the clock

flow . . . and operate the 20″ main valves from the remote station.

Now completing two years of operation, McArthur Station has an impressive record of dependability.

It will pay you to investigate Cooper-Bessemer reciprocating compressors, centrifugal compressors, engines and En-Tronic Controls for *your* expansion and modernization plans. Call our nearest office.

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COMPRESSORS: RECIPROCATING AND CENTRIFUGAL, ENGINE, TURBINE OR MOTOR DRIVEN

Why Solar designs industrial gas turbines to weigh between 1 and 1½ lb/hp

by Paul A. Pitt
Chief Engineer
Solar Aircraft Company

The weight of Solar gas turbines is the result of a design philosophy that is unique in the small gas turbine field.

Most gas turbine designs fall into one of two extreme categories. Aircraft-type engines, at one extreme, embody highly sophisticated techniques for extreme light weight in relation to horsepower, but have resulting short life. The opposite philosophy employs the ultra-massiveness of steam turbines to assure long life.

There are important disadvantages in both approaches when long life, reasonable cost, dependable operation, simple maintenance and easy transportation and installation are required. While aircraft-design engines (of ¼ to ½ hp/lb) can be modified and derated for longer service life, the resulting product is inherently delicate. This compromise inevitably results in short life.

Paul A. Pitt

On the other hand, massive design (of 10 lb/hp and up) leads to unnecessary structural bulk and introduces problems of thermal lag and distortion.

Since World War II, Solar has designed and built a variety of gas turbine units with characteristics that lead to both long life and low weight. The Saturn gas turbine engine, for example, is an 1100 hp unit intended specifically for industrial and military installations. It has a weight-to-power ratio of 1.1 to 1.4 lb/hp.

Although it is designed for long life, it utilizes only enough materials in its components to satisfy structural and thermal requirements. This approach resulted in a design that makes no compromises with durability and performance, yet meets the needs of industry for flexibility in a small package. It has an 1100 hp rating at a specific fuel consumption of 0.61 lb/hp-hr and a continuous rating of 1020 hp at 0.63 lb/hp-hr SFC.

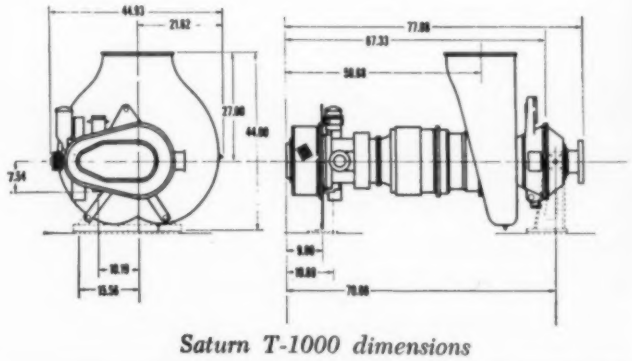
Meeting these objectives required an engine with a simple thermodynamic cycle and high efficiency components. An axial compressor was designed with an operating efficiency of 86%, and this was combined with a multi-stage, axial type turbine of advanced aerodynamic design. Over-all dimensions of the engine are shown in the figure below.

To fulfill workhorse service requirements, the engine was designed to operate at a conservative gas temperature of 1450 F continuous rating. The stress levels are also low, so that major rotating and stationary components will have more than 100,000 hours of life with long periods between overhaul. To keep costs down and assure dependability, the engine design is simple and straightforward.

In brief, the development program of the Saturn turbine adhered to three principles: Careful aerodynamic design for high performance; use of moderate temperatures and low stress levels for long life; and exhaustive component testing for ruggedness and reliability.

Presently scheduled field applications of the Saturn turbine include: Power source for 750 kw electric generator sets in process plants, portable field equipment, pipeline pumping, and gas compression in the petro-chemical industry. Other uses are as a power source for a 600 kw generator set in a commercial marine installation, propulsion units for marine and amphibious vehicles, and prime movers for off-highway vehicles.

Detailed data on Solar gas turbines and other turbomachinery is available. Write Dept. H-153, Solar Aircraft Company, San Diego 12, California.



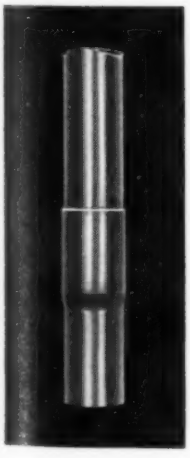
Saturn T-1000 dimensions

SOLAR
AIRCRAFT COMPANY
A subsidiary of International Harvester Company

SOUTHWESTERN INTRODUCES

SPA 190

first in a series of oil country integral joint tubular products



Engineered expressly for more economical "Slim Hole" and "Multiple" completions

OUTSTANDING FEATURES

1. Recessed box for easier stabbing and greater resistance to hoop stress induced by make up.
2. Laboratory pull tests prove joint efficiency to be much greater than theoretical (calc.).
3. Interchangeable with 1½" 10Rd. A.P.I. non-upset tubing.
4. Multiple hydrostatic, shock and crush tests assure completely sound welds and true dimensional wall thickness.
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6. Manufactured to conform to applicable parts of A.P.I. 5A standards.

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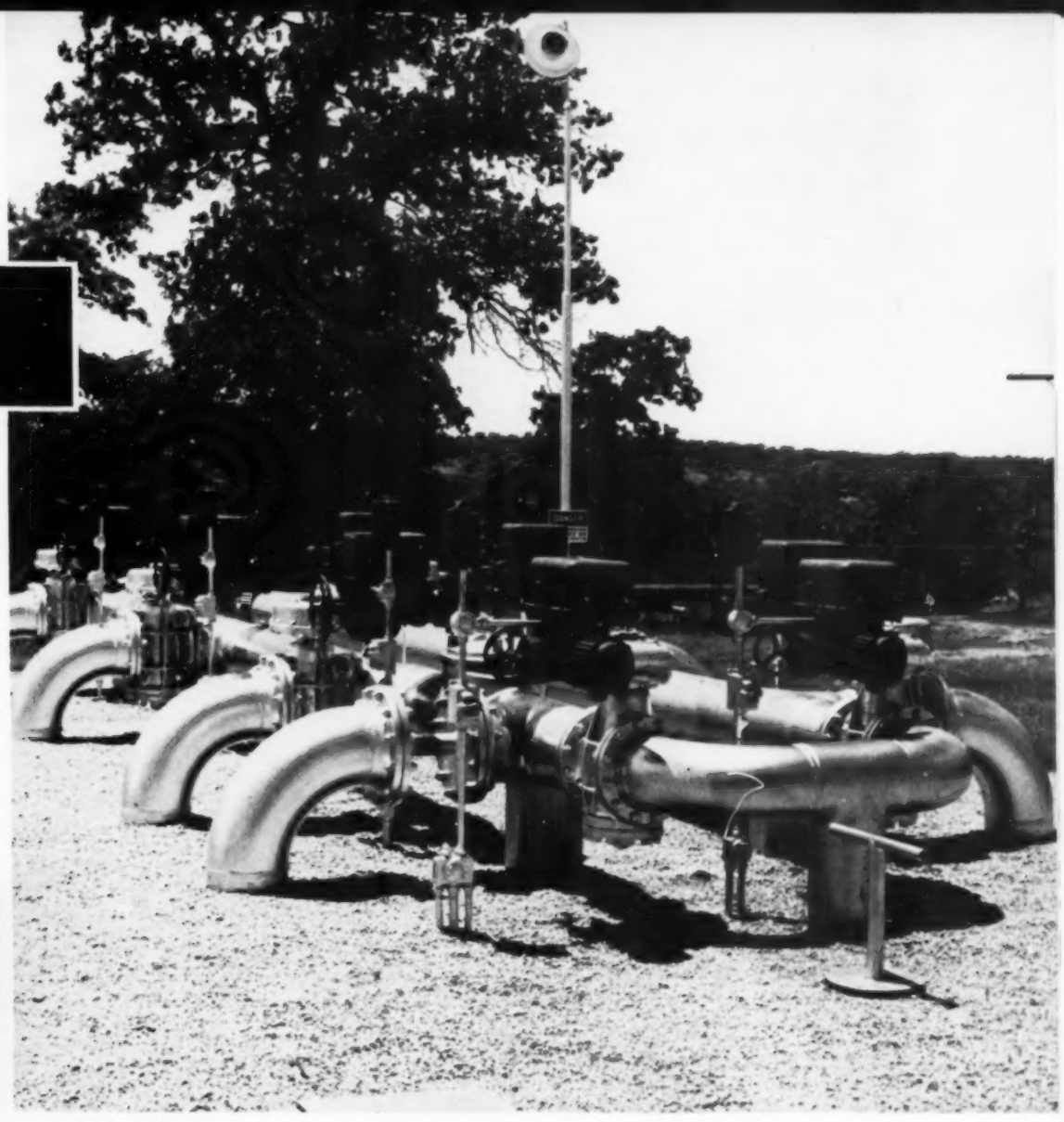
Fast, economical pipeline construction and dependable operation are assured with J&L Electricweld Line Pipe.

High ductility for easier field bending and ends that are uniformly round to line up quickly for fast, dependable welding will speed your lines across even the most rugged terrain.

Multiple testing of every length of J&L Electricweld Line Pipe assures top performance during installation and operation. J&L testing includes ultrasonic inspection of the weld area, hydrostatic pressure testing, visual inspections, flattening tests, and magnaflux examination of both ends of every joint.

J&L Electricweld is available in sizes from 6⅝" O.D. to 12¾" O.D. J&L Seamless Line Pipe is produced in sizes from 2⅜" O.D. to 14" O.D.



Above, Rockwell-Nordstrom valves doing sentinel duty on the manifold of a terminal at a products pipeline station. Flanges and welding fittings are by Taylor Forge.

Pipelines throughout the nation are constructed and maintained more economically with products sold by J&L Supply . . . the best available.

Ask your J&L Supply man for technical material on pipeline products.

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LOWER OVERALL COSTS WITH HI-YIELD CAL-METAL PIPE

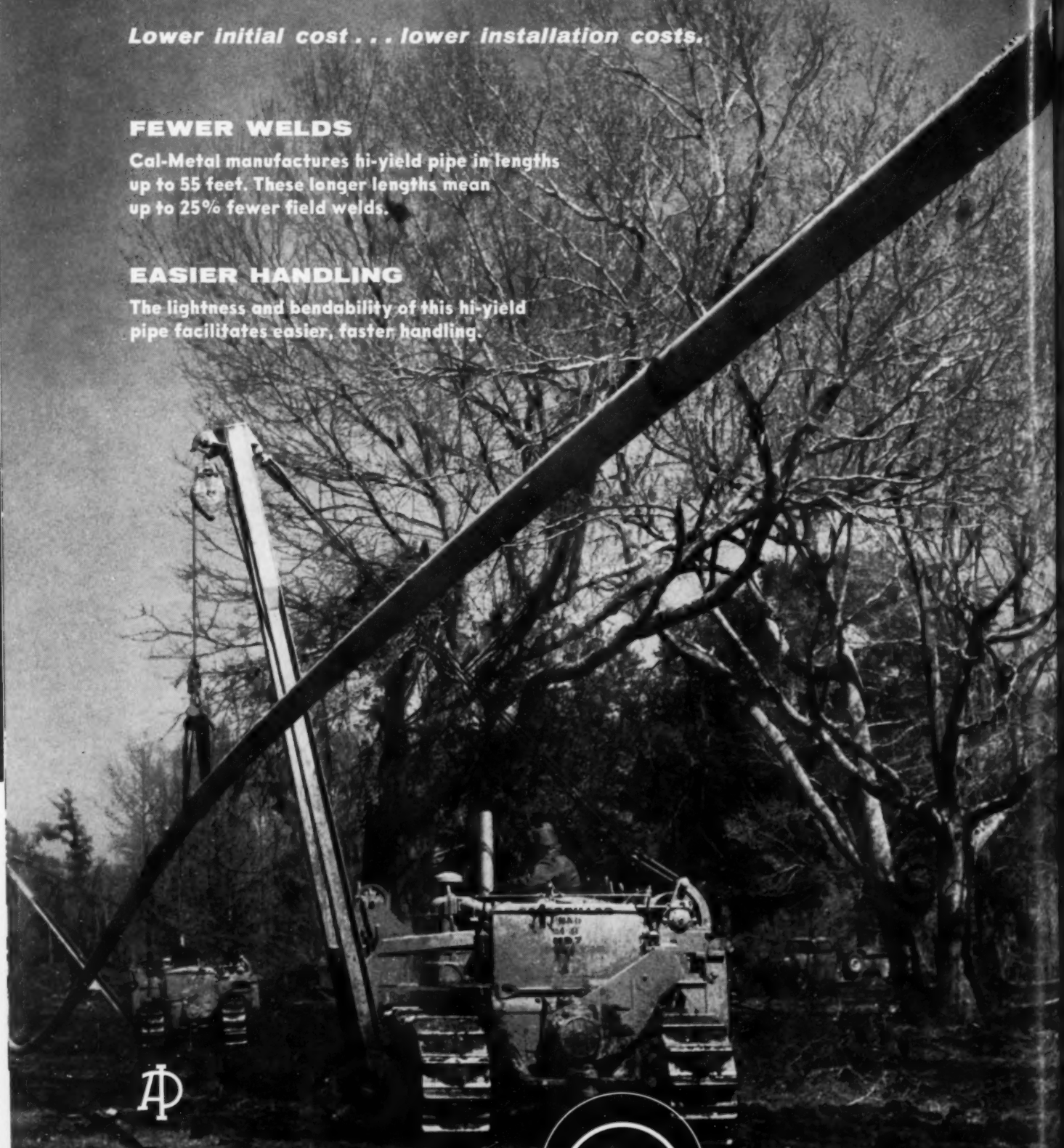
Lower initial cost . . . lower installation costs.

FEWER WELDS

Cal-Metal manufactures hi-yield pipe in lengths up to 55 feet. These longer lengths mean up to 25% fewer field welds.

EASIER HANDLING

The lightness and bendability of this hi-yield pipe facilitates easier, faster handling.



CALL, WRITE OR WIRE FOR A QUOTATION ON YOUR NEXT PIPE REQUIREMENT.

CAL-METAL PIPE
CORPORATION OF LOUISIANA

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ENGINEERED METAL PACKINGS

for Pumps, Engines and Compressors

Selecting the proper metal packing—and packing ring material —assures positive, efficient sealing against gas, air, steam.

Specifying the right material for metal packings can make a big difference in seal effectiveness and packing life. Garlock offers a wide choice, each designed for specific temperatures and pressures:

GRAPHITIC CAST IRON. Unequaled wear-resistant qualities. Graphite assures continuous lubrication between packing and rod. Recommended against 1500 p.s.i. pressures, 800°F temperatures.

STANDARD HI-LEAD BRONZE. Chosen after years of research, this standard bronze has a yield point of 26,000 lbs./sq. in., a tensile strength of 31,250 lbs./sq. in. Can be used against 10,000 p.s.i. pressures, 800°F temperatures.

HI-LEAD SUPER BRONZE. Possesses a yield point of 14,750 lbs./sq. in., a tensile strength of 25,500 lbs./sq. in. Due to better wear properties, it can be used at pressures to 40,000 p.s.i., temperatures to 800°F.

AMBERITE—PLAIN OR GRAPHITIZED. Tough, strong, high impact strength. Excellent where corrosion and mildly difficult lubricant and wear conditions exist. Apply against 600 p.s.i. pressures, 250°F temperatures. Other grades available to meet various conditions.

BABBITT. Used on soft rods and where corrosion is present, lubrication is limited. Standard Babbitt has tensile strength of 10,000 lbs./sq. in. More expensive type has better wear qualities. Recommended for 5000 p.s.i. pressures, 425°F temperatures.

CARBON. Used where no lubricant is allowed. Generally affords the best wear-strength combination available. 700°F is recommended temperature limit; pressures may vary according to grade of carbon used.

TEFLON.* Far superior to many other rod packing materials because of outstanding chemical resistance, ability to retard wear and friction. Available in carbon- or glass-filled.

GARLOCK

Discuss metal packing materials with your Garlock representative. Call him at the nearest of Garlock's 26 sales offices and warehouses throughout the U. S. and Canada. Or, write for Catalog AD-166. Garlock Inc., Palmyra, N. Y.

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Order from the Garlock 2,000 . . . two thousand different styles of Packings, Gaskets, Seals, Molded & Extruded Rubber, Plastic Products

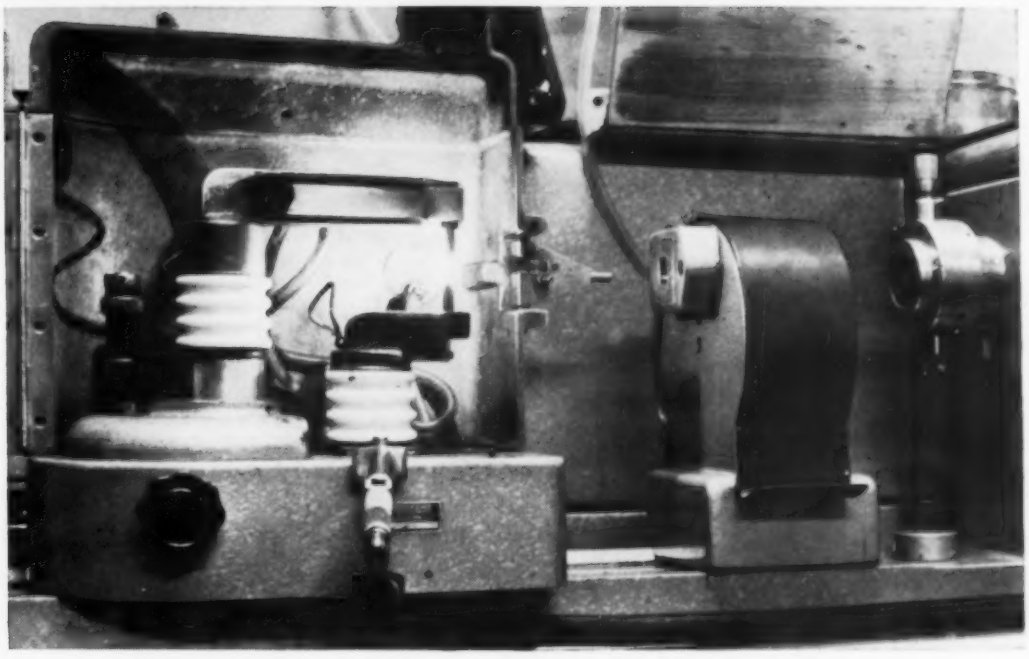
*Du Pont Trademark for TFE Fluorocarbon Resin

10,125 tests a day assure consistent quality in

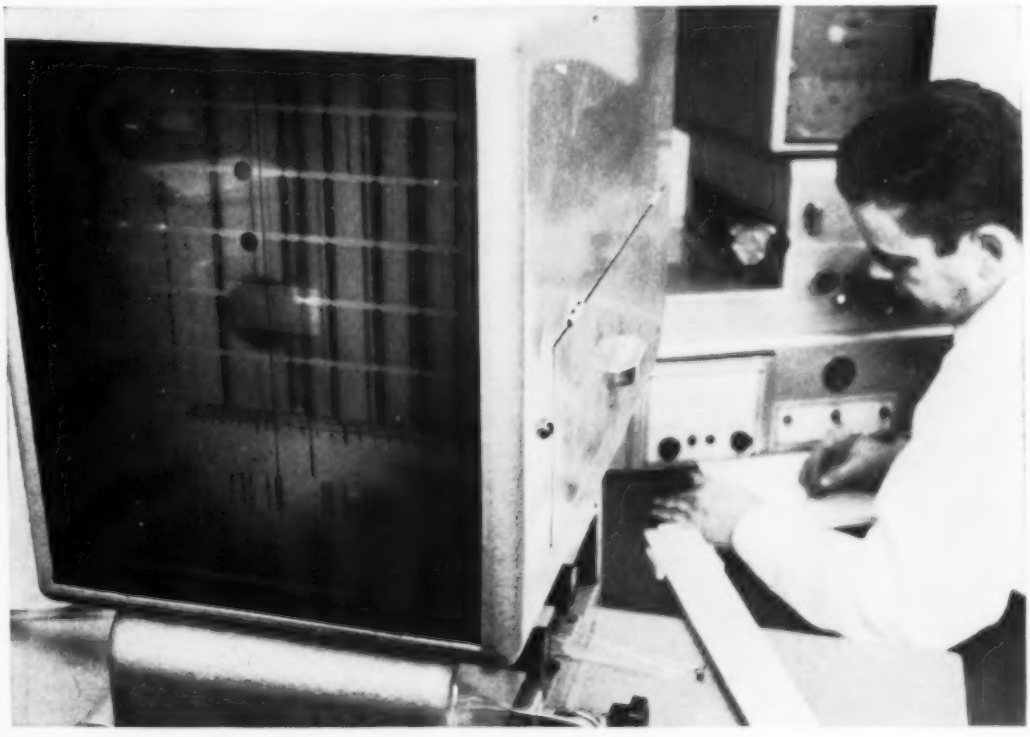
GULF MAKES THINGS

These bottles contain samples of a variety of Gulf fuels and lubricants. Each has been subjected to a series of quality control tests at Gulf laboratories. Any one of the tags shown might carry the "pedigree" of a Gulf product for a drilling rig or a pipeline pumping station.

Product purity is policed constantly at Gulf. During the refining process, samples from *every* lot of Gulf gasoline, diesel fuel, lubricating oil and grease are tested and re-tested to make sure that formulations are exact and that impurities are essentially eliminated. For ex-



Emission Spectrograph (above) causes undesirable elements in a petroleum sample to emit their characteristic light spectrum which is photographed on a strip of film. In the Densitometer (below) the spectrum on the film is evaluated to identify the presence of metal contaminants down to less than one part per million.



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A continuing program of quality control tests is one of the reasons we say: Gulf Makes Things Run Better!

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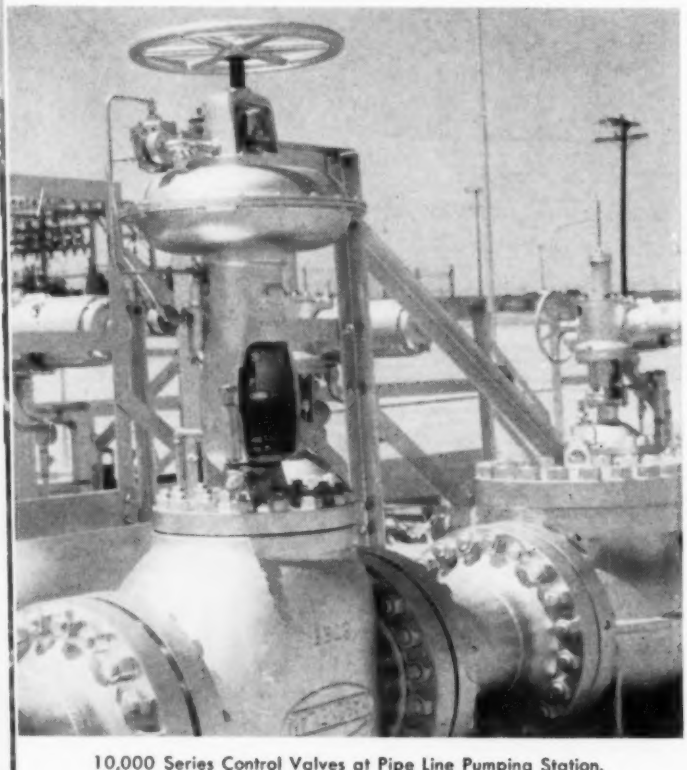
GULF®

Masoneilan Butterfly Valves, equipped with pneumatic positioner, used on gas pipe line auxiliaries.

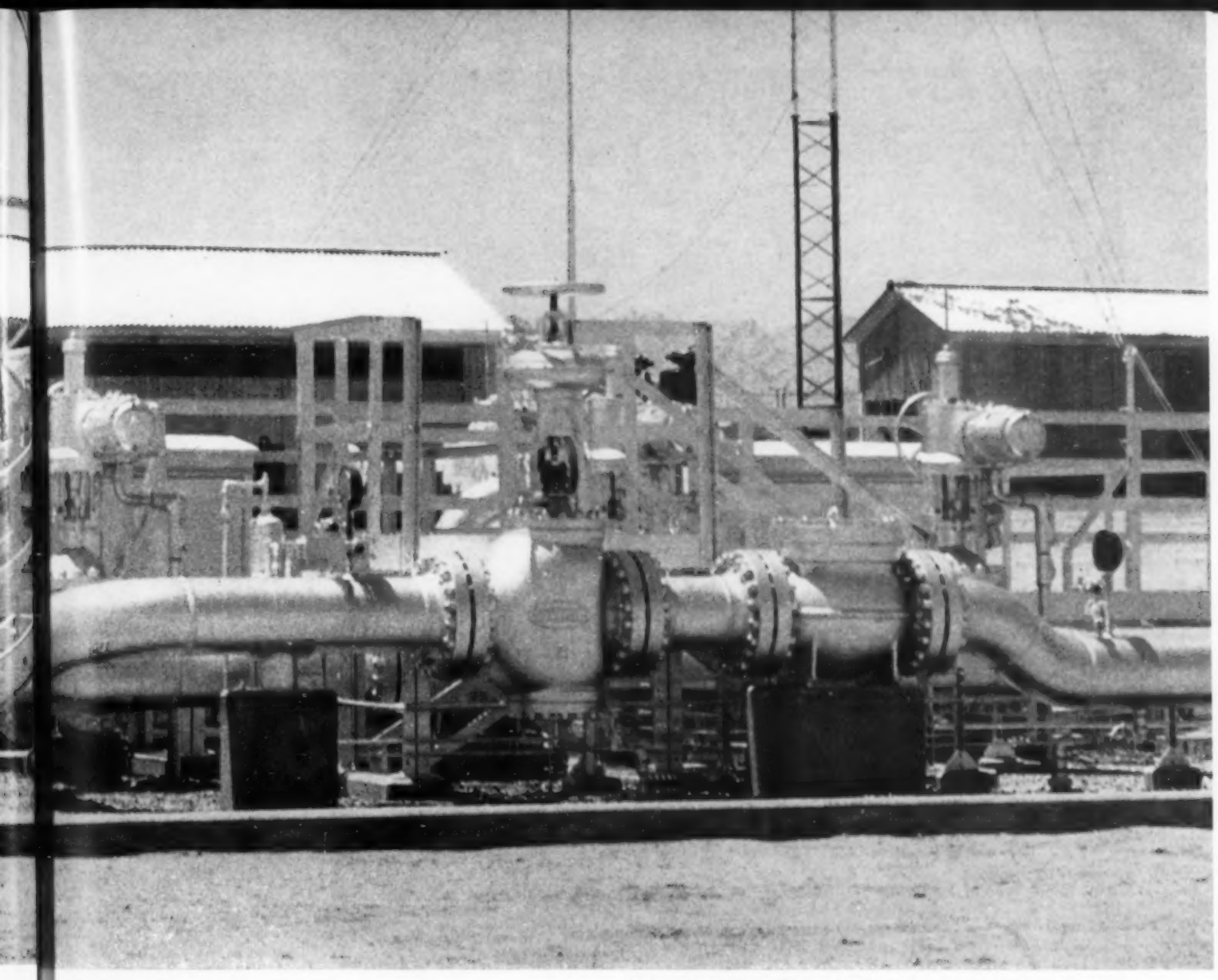
Masoneilan Percentage Piston Control Valves with Series 2800 Controllers.



10,000 Series Control Valves at Pipe Line Pumping Station.

Masoneilan Control Valves provide flexibility in obtaining desired pressure differential in friction tube bundles at a Pipe Line Station.

2700 Series Controllers mounted on 10,000 Series Control Valves.



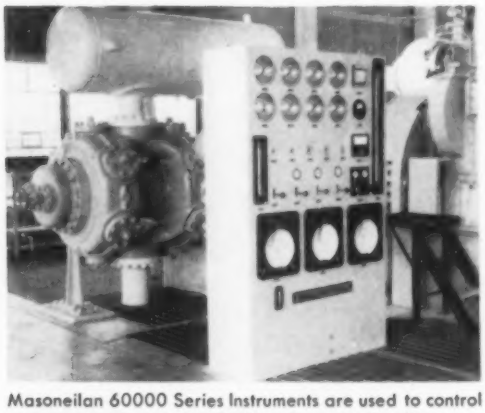
Typical installation of Control Valve for a Crude Oil Pumping Station.

Masoneilan Controls Demonstrate Dependability In Modern Pipeline Operation

Masoneilan Controls — instruments, control valves and auxiliary equipment — are demonstrating the dependable, low-maintenance service required for profitable pipeline operation. Remote station control, and other modern concepts designed to obtain operating simplicity and economy, demand this top dependability.

Versatility in application of standard Masoneilan products affords further opportunities for cost saving. Extensive pipeline control experience enables Mason-Neilan engineers to exploit this versatility to your advantage.

For product data and application assistance, contact a Mason-Neilan representative, or write:



Masoneilan 60000 Series Instruments are used to control pressure at Compressor Stations for gas pipe lines.

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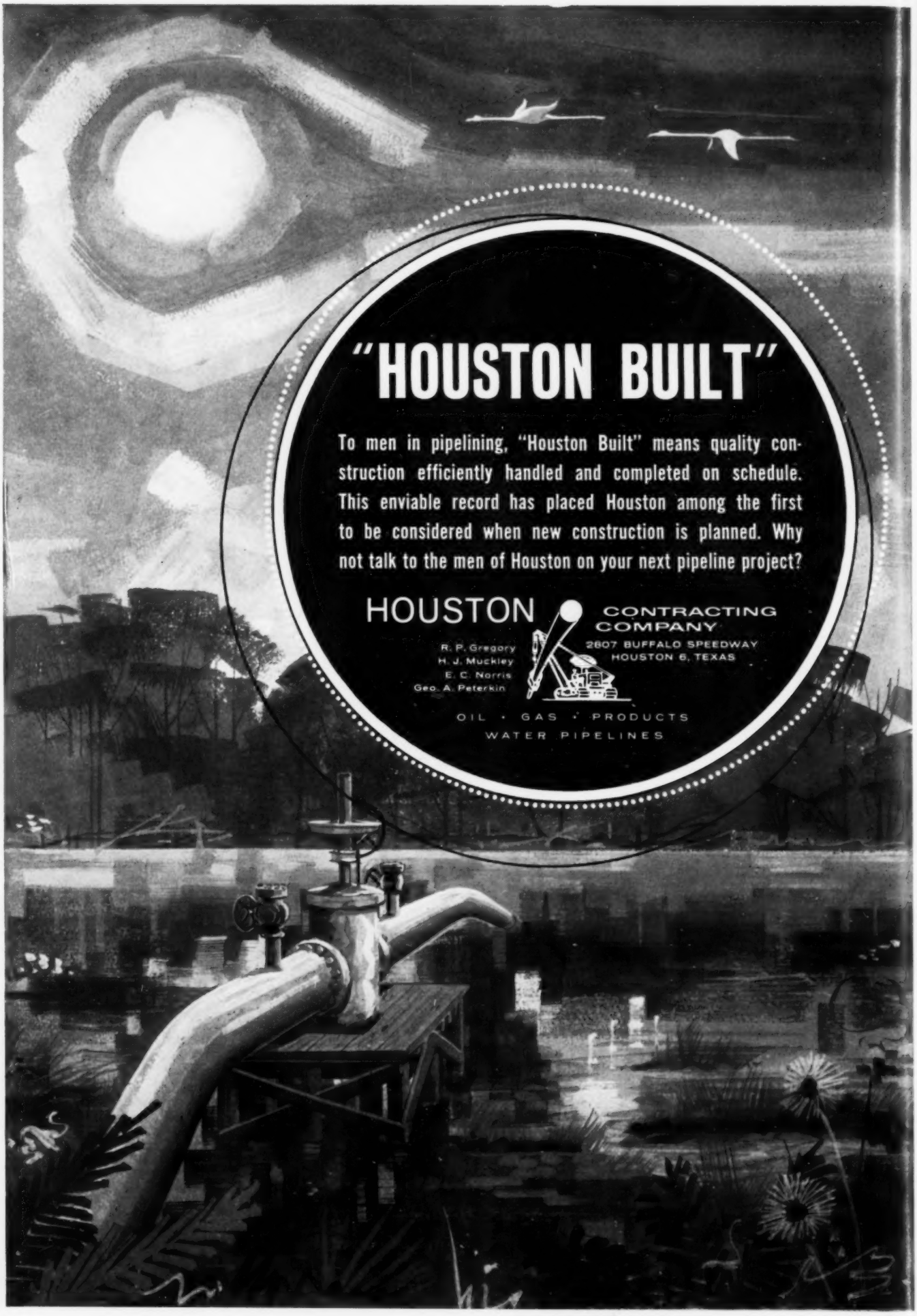
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PIPE LINE PANORAMA

Gas Pipelining to Continue Full Blast Next Four years . . . Construction of gas transmission lines will top $1 billion this year and during the three following years construction of new lines will tally about $2.5 billion—according to figures recently released by the American Gas Association.

The biggest boom in the history of the gas industry is taking place right now! This year pipe line and distribution companies are spending an estimated $2.233 billion! But brighter days still lie ahead. For in 1963 new records should be set.

Construction of 1,400-Mile Alberta to California Line to Start . . . It took four years of planning and applying, but when the California Public Utilities Commission recently authorized PG&E to build the 300-mile California section of the Alberta, Can., to California pipe line all green lights were flashing. The project had received the earlier blessing of the FPC, the Province of Alberta and the Canadian National Energy Board.

Construction of this $400 million line will have a heavy impact on the California market. PG&E President Norman R. Sutherland predicts that winter after next, the system will be delivering 415 million cubic feet per day.

Contractors Labor News Notes . . . It's not news to contractors but labor costs still are rising in pipe line construction. Figures recently reported by the Bureau of National Affairs show average hourly wage increases for all construction industry crafts is 14.6¢ for the first six months of 1960. Regional averages vary from 11.9¢ in the South to 17.5¢ in the Far West. Common labor increases in pipe line construction averaged 10.1¢ throughout the U.S.—from about 5¢ in the South up to 20.5¢ in the Far West.

Canadian Contractors-Unions Complete Negotiations . . . The PLCA of Canada recently completed negotiations for new five-year agreements with the U. A. and the International Union of Operating Engineers. Welders will get a 15¢ increase now and an additional 10¢ boost May 1961, plus 4 percent vacation pay and $15 per day for waiting time; Canadian Operating Engineers' wage rates vary in different parts of Canada in agreement extending through April 30, 1962.

First Two-Cycle V-Type Engine Driving Centrifugal Compressor . . . has commenced operations at Columbia Gulf's Hampshire, Tenn., station. The engine has 4,000-hp and its fuel economy is about 6,600 Btu's per hp hour. New type speed increaser previously used on ships and locomotives has gear ratio of 15.3 to 1. All of Columbia Gulf's 10-main line stations will be unattended and remotely controlled from Nashville, Tenn., control center where complete panel system is now being installed.

New FCC Microwave Technical Standards Released . . . The FCC has released a Report and Order in Docket No. 13083 presenting interim technical standards governing grants for use of microwave frequencies for future private communications systems. Standards effective January 1, 1961, cover power, tolerance, bandwidth and beamwidth and apply with some exceptions to private point-to-point microwave systems; specifically excepted from the new standards are existing microwave systems.

These Ideas and Inventions Can Make Maintenance Easier

The editors called on the industry for maintenance ideas. Here are the results. Add them to your maintenance notebook

By Donald M. Taylor, Engineering Editor
PIPE LINE INDUSTRY

IT'S BEEN SAID that the average man thinks only 15 minutes out of the 24-hour day. If this is true, many pipeliners are not average men. For many of them keep up a running fire of new ideas that contribute to both maintenance and operation of our pipe line systems. Men who think only 15 minutes or so a day could not keep pipe lines in operation 24 hours a day 365 days a year.

For example, take the novel ideas given below which save time, money, wear and tear on our engines, pumps and other equipment. Not only did these ideas come as a result of considerable thinking, in many instances, they are the result of experimental work done by pipeliners during off-duty hours.

The editors of PIPE LINE INDUSTRY are greatful for these ideas which were contributed by various companies throughout the industry. Most of the ideas should add materially to the bag of maintenance tricks used by pipeliners throughout the industry:

1. How to Measure Valve Seat Wear While an Engine is Running

Using an ordinary flashlight, a feeler gage and some wire, Transco pipeliners invented a means of measuring valve and seat wear in four-cycle engines while they are running. Once the method proved effective, the pipeliners set out to improve it and ended up developing an instrument which Transco likely will patent and license for outside manufacture.

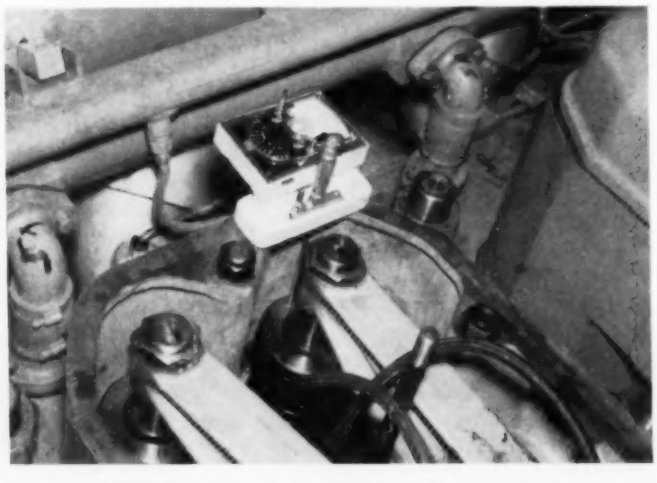

FIGURE 1—This instrument measures valve wear while engine is running! The instrument probe contacts the valve spring keeper As valve and seat wear occurs, the valve will increase its "sinkage" and the keeper will come higher.

The device is based on a simple principle. As valve and seat wear progresses, the sinkage of the valve increases. As this occurs, the valve spring keeper underneath the rocker arm travels progressively higher in proportion to the sinkage. Summed up, this means that if the travel of the valve spring keeper can be measured precisely from time to time under identical conditions while the engine is running, the difference in readings will reflect the wear of the valve and the seat.

Here's the way the device was originally developed. A micrometer with a six-inch probe was mounted on a micarta block which serves as an electrical insulator. The block is dowelled to fit a machined area on the rocker box right above the keeper on the valve spring.

The batteries from a flashlight are connected to the micrometer and to the engine. When the probe touches the keeper, the circuit is completed and the light glows.

Thus, to take weekly measurements, the pipeliners slip instrument into the dowelled holes, adjust the gage so the light barely glows red and read and record the vernier. Changes in the reading reflect valve sinkage or wear.

FIGURE 2—**The original instrument was made from a micrometer, flashlight and wire.** The mike is mounted on an insulating block which is dowelled to fit a machined surface on the rocker box. The probe is adjusted to barely contact the valve spring keeper. When it touches, the light will glow.

FIGURE 3—**Using the original instrument** to take a reading of the valve and seat wear. The vernier readings can be plotted as valve wear.

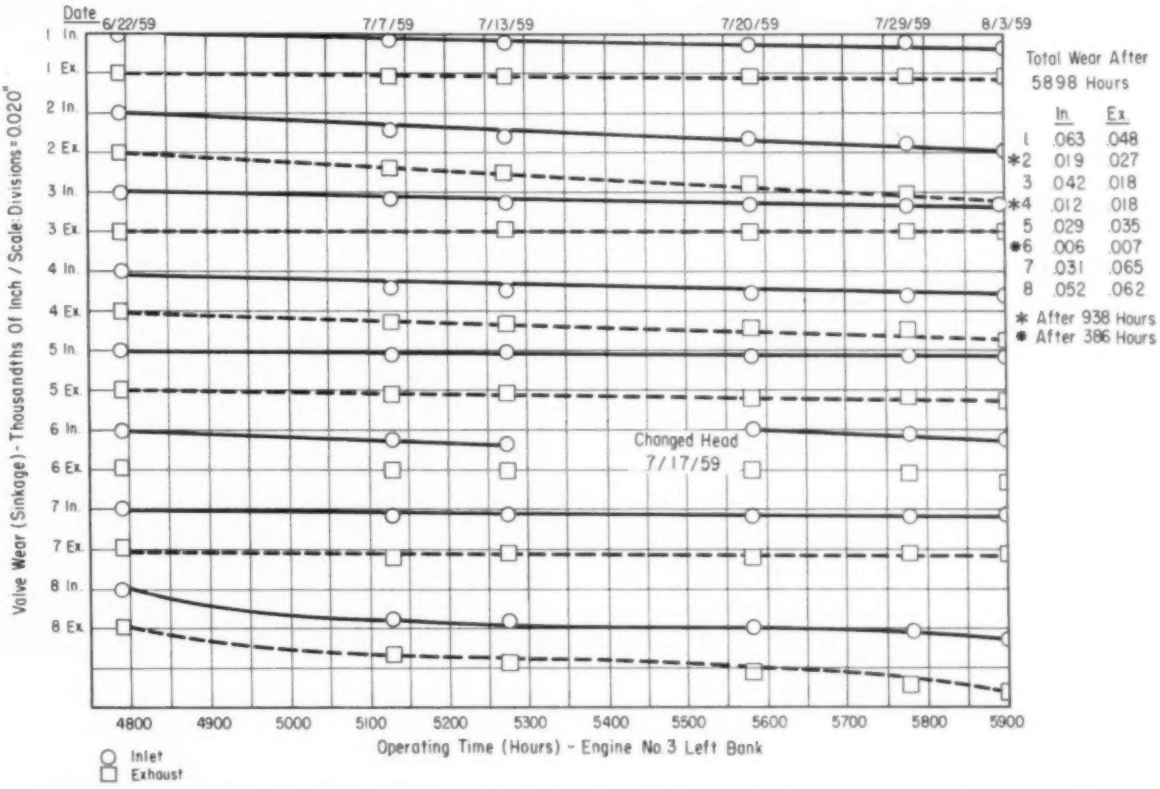

FIGURE 4—**A plot of valve and seat wear** for eight-cylinders of 16-cylinder four-cycle engine. This chart makes it easy to predict maintenance problems ahead of time. The total wear is tallied from sheet to sheet. The curves are used to show trends and to determine when heads should be changed.

Valve wear is plotted as shown in the accompanying chart (Figure 4). From the curves, pipeliners can predict the need for maintenance.

Figure 1 shows the instrument which was developed from the flashlight, wire and gage. It is more sensitive and takes more accurate measurements.

Idea from Transcontinental Gas Pipe Line Corp.

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2. Lap Valves While Engine Heads are Mechanically And Thermally Stressed

Lap valves into their seats when the engine is cold and unstressed and they will be several thousandths off when installed in the engine. The cause? Under operating conditions, the engine heads are hot and mechanically stressed by the engine head bolts. Thus, the valve seat, simply isn't the same as it was when the valve was lapped into it and the valve itself has changed with temperature.

Why not, reasoned Transco pipeliners, thermally and mechanically stress the heads while the valve was being lapped? The resulting job should be an exact fit when the head is installed on the engine.

To accomplish this, they fabricated a special template

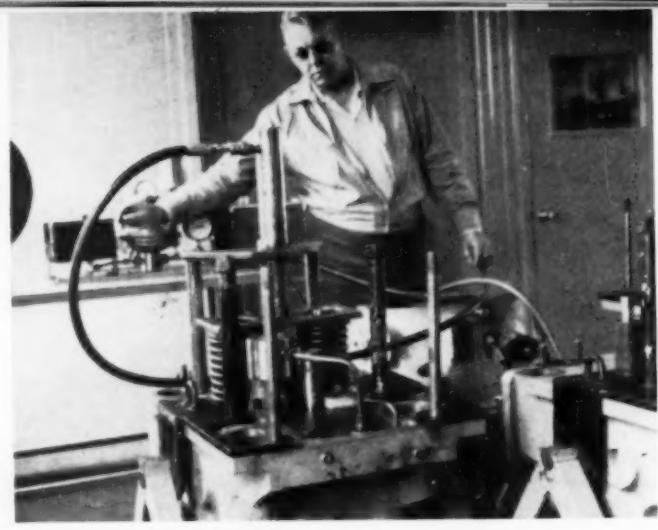


FIGURE 5—**Lapping valves in cylinder head which is thermally and mechanically stressed to duplicate operating conditions. M. E. Dougal, superintendent of Transco's Station 23 developed this idea.**

which bolts to the cylinder heads. When bolts are tightened the mechanical stresses ordinarly encountered when the head is bolted in place on the engine are applied. In addition, this template makes it possible to flow water through the head, and from a large hot water heater, operators circulate 180 to 190 F water through the head until operating temperature is reached. Then the valve lapping equipment is installed and the valves are lapped into the cylinder head.

Since this procedure was devised, the valves have fitted their seats with precision.

Idea from Transcontinental Gas Pipe Line Corp.

3. Testing Spark Plugs At Operating Pressures And Temperatures

The best way to test any piece of equipment is to test it under operating conditions. Take, for example, the matter of testing spark plugs. Normally, they are tested at atmospheric temperatures and pressures. But a more accurate test would be to bring the pressure and temperature to approximately those of the engine at the time of firing.

Shown here is a method of testing spark plugs divised by Transco operators at the company's Station 23 near Houston. The cylinder of nitrogen supplies the pressure, the element out of a hot plate supplies the proper temperature and a mirror arrangement beneath the spark plugs provides a means of visually checking their firing.

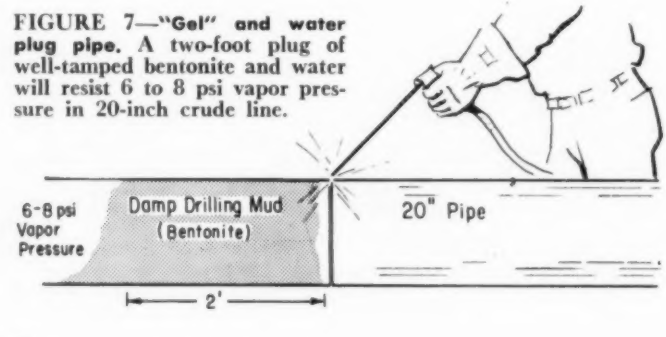
Idea from Transcontinental Gas Pipe Line Corp.

FIGURE 6—**Testing spark plugs under operating conditions. Pressure comes from bottle of nitrogen. Heat comes from electrical heating element. Mirror below plugs show firing as motor-driven interrupter duplicates engine speeds.**

4. Plug Crude Line With Drilling Mud for Tie-in Lines

An inexpensive way to seal off gaseous vapors in preparation for making tie-in welds in crude lines is to plug the end of the pipe with drilling mud. Not only is the mud more efficient than that made with ordinary clay, it eliminates the hazards to pump seals, impellers, gate valves and other equipment caused by the abrasives found in the clay.

FIGURE 7—**"Gel" and water plug pipe. A two-foot plug of well-tamped bentonite and water will resist 6 to 8 psi vapor pressure in 20-inch crude line.**



The mud used is powdered bentonite—called "gel" by most mud companies. It is mixed with water to a consistency of molding clay and then tamped into the line. The most efficient mixture is 11 gallons of water to 100 pounds of bentonite. A plug two feet long in a 20-inch line will hold 6 to 8 psi and is entirely safe for open lines.

After the line has been welded and placed in operation, the plug will disintegrate in the oil stream. What's more, it does not harm the pump and valves when it passes through.

Service Pipe Line Company credits A. M. Hill, superintendent of line maintenance with this idea.

Idea from Service Pipe Line Co.

5. Panic Latches for Compressor Building Doors

When panic comes, men seldom think clearly. In panic, men have been killed because they could not find the rip cord ring for a parachute on their chest. In panic, they have been crushed against a door that would easily have opened, if the handle had been turned.

Little wonder, designers have given considerable thought to the compressor building doors. For in the compressor building when emergencies arise, they come suddenly.

A Transco pipeliner has come up with a top idea for a door latch for compressor buildings. It will keep the doors closed—even in strong winds, yet, it can be pushed open without turning any handle or levers. The mechanism is so simple you may wonder why you didn't think of it yourself.

In the door there is a spring-loaded ball bearing which protrudes far enough past the door's edge to catch a matching hole in the metal door frame. The size of this opening in the frame determines the ease or difficulty of closing and opening the door. The larger the hole, the greater the penetration of the steel ball, and the more pressure required to open the door.

In case of fire or explosion, operators need only run into the door to open it.

Idea from Transcontinental Gas Pipe Line Corp.

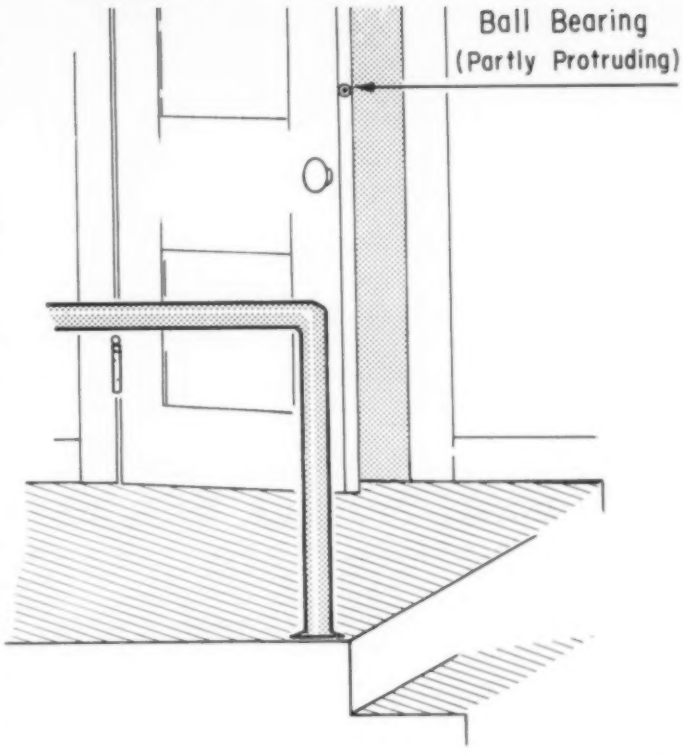


FIGURE 8—**Ball bearing in door** makes excellent panic latch. Any sizable push will open door, yet the ball bearing will seat in hole in door frame to hold the door shut despite strong winds.

6. How to Change Bonnet Gasket in Gate Valve Without Draining Line

To change the bonnet gasket in a gate valve without draining the line it is necessary to replace the force exerted by the bonnet during the operation. The tools—which Atlantic fabricated in their own shops—are shown

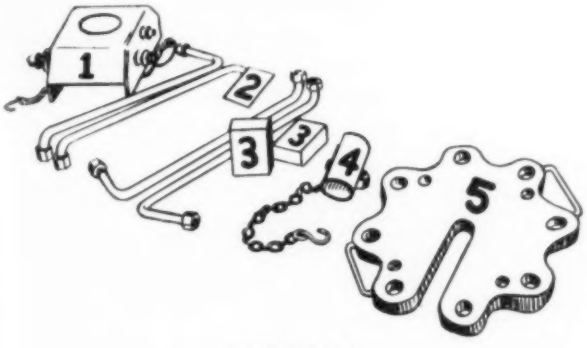


FIGURE 9A

here (Figure 9a). No. 1 is a Yoke Retainer; No. 2 is a Yoke Retainer Arm; No. 3 is a Safety Block; No. 4 is a Spacer and No. 5 is a Compression Flange.

Step 1. Open (Figure 9b) the valve, remove two studs from flanges on each side of valve as shown.

Step 2. (Figure 9c)—Remove the ball bearing yoke and dismantle. Replace the yoke stem nut and thrust-bearing yoke top. Place yoke retainer over thrust-bearing yoke top; attach yoke retainer arms to retainer and flanges as shown. Replace the valve wheel and close valve.

Step 3. (Figure 9d)—Remove nuts from packing gland bolts; raise gland follower. Remove bonnet bolts; raise bonnet with the aid of windlass on yoke retainer and insert 2 x 4 x 4-inch safety blocks between bonnet and valve body. Remove old gasket and clean gasket seat. Insert spacer around valve stem and on top of upper wedge.

Step 4. (Figure 9e)—Place compression flange with slot around stem and on top of spacer and bolt into place using four bolts. Tighten sufficiently to relieve tension on yoke retainer assembly. Release windlass, permitting bonnet to rest on safety blocks. Turn valve wheel to open until tension is relieved between thrust bearing yoke top and yoke retainer. Remove nuts from top of yoke retainer arms; loosen nuts on bottom of retainer

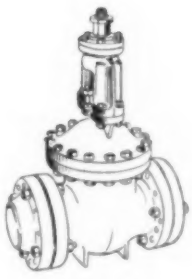


FIGURE 9B

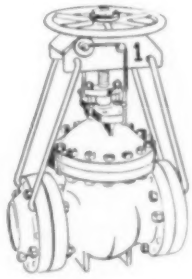


FIGURE 9C

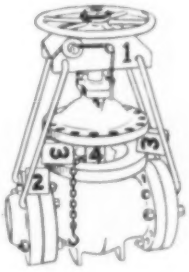


FIGURE 9D

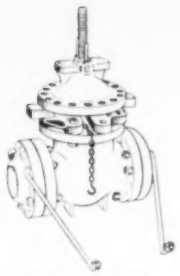


FIGURE 9E

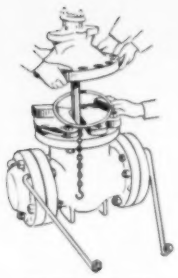


FIGURE 9F

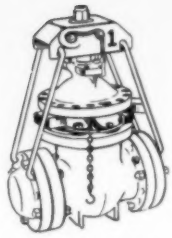


FIGURE 9G

arms and allow arms to swing away from retainer. Remove wheel, yoke retainer, yoke stem nut, thrust-bearing yoke top and packing gland follower.

Step 5. Remove bonnet.

Step 6. (Figure 6f)—Place new bonnet gasket over stem and on top of compression flange. Replace bonnet and packing gland follower.

Step 7. Replace yoke stem nut, thrust-bearing yoke top, yoke retainer and wheel. Reassemble yoke retainer arms and turn valve wheel to close until snug.

Step 8. (Figure 6g)—Remove compression flange and spacer; clean gasket surfaces; place gasket in place and lower bonnet. Install bonnet studs and tighten. Tighten gland follower. Relieve tension on yoke retainer assembly. Remove yoke retainer arms, retainer, thrust-bearing yoke top and yoke stem nut. Reassemble yoke assembly; install wheel, and clamp nut. Replace studs in flanges and open valve to check for leakage when pressure is sufficient.

Idea from Atlantic Pipe Line Co.

7. Hydraulic Pressure Couples or Uncouples Centrifugal Pump Hubs

Instead of using a key and an interference fit to secure the coupling to the shaft of a centrifugal pump, Service Pipe Line Co. uses a keyless taper fit. The hub is coupled or uncoupled by expanding it with internal hydraulic pressure.

With this type fit, the shaft and hub bore are tapered 0.006 inch per inch. An interference of 0.001 inch per inch of diameter plus 0.001 inch is allowed on assembly.

The hub is bored with a groove near its center which measures $\frac{1}{32}$-inch deep and $\frac{1}{8}$-inch wide. This groove is connected to the outside of the hub by a $\frac{3}{32}$-inch hole which has a $\frac{9}{16}$-inch threaded opening for connection with a compression type hydraulic connector.

The hub can be easily pressed onto the tapered shaft by slipping it on until the groove is covered and then applying pressure from a small hydraulic pump to expand it. Removal of the hub is just as simple as the hydraulic pressure not only expands the hub but, if continued, pushes it off by acting against the taper.

Hubs assembled in this manner eliminate any possibility of a damage coming from strong arm methods of assembly sometimes necessary with other type hubs. This method of coupling centrifugal pumps with drivers was devised by F. V. Cook, Service's master mechanic.

Idea from Service Pipe Line Co.

8. Two Ways to Clean Up Cooling Waters

Operators at field stations are sometimes troubled with dirty or rusty cooling water. Here are two ways which have proved effective in cleaning it.

Construct a filter of scrap pipe and excelsior and pipe the water through it. This usually clears up the water in two or three days.

Second, install a spare oil filter case with a single sock type element—about 7 x 18 inches. By-pass a portion of the water through this filter and in a few days the water will be clear. Leaving the filter in service is necessary, changing elements as needed.

9. This Versatile Hydraulic Boom Costs $25 to Make

This hydraulic boom on its three-wheel base has a thousand uses. It can be used to lift engines in and out of automobiles and trucks; it picks up trailers, pigs, valves and other pieces of equipment normally requiring the services of a crane, dragline, or sibeboom.

Texas Eastern pipeliners Eddie Sickmann, Maurice Tiemeier and Joe Ittner dreamed up the idea, made it and are now benefiting from its great versatility. They robbed the scrap pile for some steel pipe and the set of dolly wheels. They found a hydraulic cylinder no longer needed in the bomb bay of an old airplane and rounded

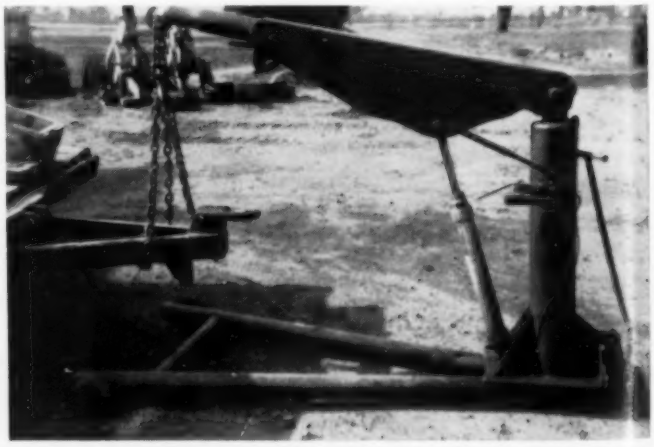


FIGURE 10—Handy hydraulic boom which telescopes and can easily be transported on three casters and pull handle. The boom, made from airplane parts, scrap pipe and dolly, will lift over 1,000 pounds.

Quantity	Size	Description
16'-10"	3-in	Pipe, Schedule 40
3'-1½"	6-in	Pipe, Schedule 40
5'-0"	2½-in	Pipe, Schedule 40
2'-1"	2-in	Pipe, Schedule 40
6 sq. ft.	¼-in	Steel Plate
1 sq. ft.	3/16-in	Steel Plate
1 sq. ft.	¾-in	Steel Plate
3'-8½"	½-in	Pipe (handle)
4 ea	¾-in	Bolts with washer
3 ft.	⅜-in	Copper tubing
1 ea.	½-in	Pipe plug
2 ea.	2" x 6"	Wheels with necessary fittings
1 ea.	2" x 6"	Trolley Wheel
1 ea.	½-in	Coupling
1 ea.	1000-lb	Hydraulic hand pump
1 ea.		Check and relief valve
1 ea.		Single acting hydraulic cylinder

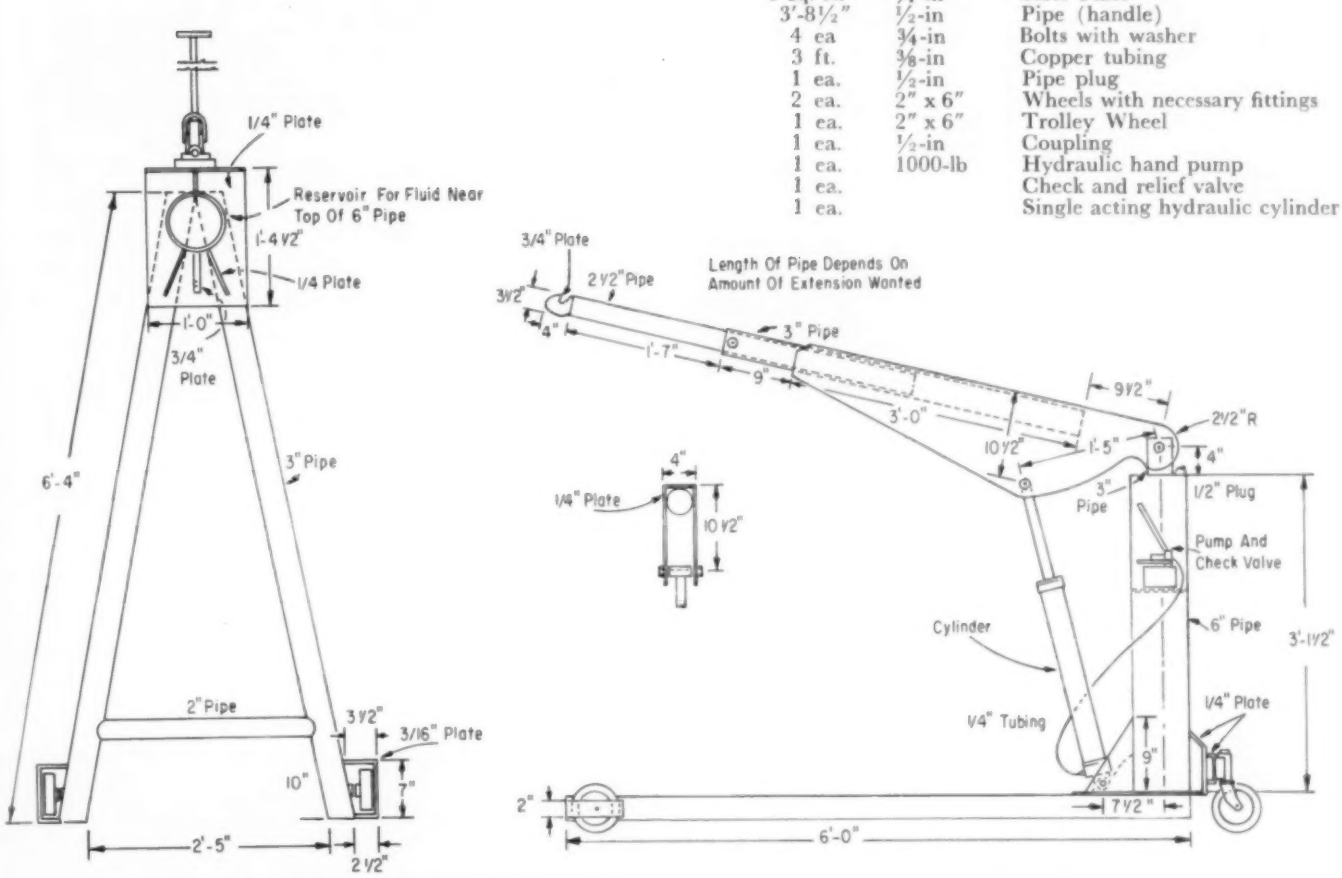


FIGURE 11—Details of the hydraulic boom. Bill of materials is shown at upper right.

up an emergency hydraulic pump from an old aircraft.

They converted the upright piece of pipe to a hydraulic oil reservoir, mounted the hydraulic pump on the side and added the handle to the front dolly wheel. Final cost of the unit ran only $25. A comparable piece of equipment costs $187.50 from a manufacturer and it does not have the telescoping boom (see drawing) and the pull handle on the front swivel wheel. What's more, the Texas Eastern model can out lift the store bought equipment by several hundred pounds.

Idea from Texas Eastern Transmission Corp.

10. Lamp Changer Carriage Rides Traveling Crane

A lamp changer carriage which rides on the traveling crane and hoist in a compressor station has taken most of the risk out of changing overhead light globes. The carriage is made of light angle iron, two casters, a trolley and an overhead rail.

The carriage is sized to hold a man—standing or sitting. The casters which ride against the I-beam of the traveling crane and the garage door type rail and trolley permit the carriage to travel laterally as desired. Cost of this equipment is slight.

Idea from Texas Eastern Transmission Co.

FIGURE 12—Lamp changer carriage will hold man who can travel laterally to reach light fixtures as necessary.

FIGURE 13—**New pig virtually eliminates comingling of products. Bottom cups act as piston to drive tight fitting spheroid through the line.**

11. Pig Reduces Comingling Of Products 70 Percent

By combining the rubber cups of conventional pipe line pigs with a spheroid, Gulf Oil Corp. researchers came up with a device which virtually eliminates comingling of products in a pipe line. Prior to running, the spheroid with its three-inch-thick walls is pressured with water to a diameter ¼-inch larger than the 24-inch pipe for which it was designed. The two rubber cups behind the sphere serve as a piston to force it through the line. Tests on the Laurel Pipe Line Company system indicate little mixing of the products it separates.

Idea from Gulf Oil Corp.

12. Prevent Paraffin from Plugging Field Gathering Lines

This is simple. Coat the lines internally. How effective is this? On a number of lines which had to be scraped every week—and occasionally plugged despite the scraping—internal coating has made it unnecessary to run scrapers. After two years' operation there has been no appreciable paraffin build up.

13. Gas Lights in Auxiliary Room Supply Emergency Light

Many gas companies—especially Arkansas-Louisiana Gas Company—have fostered the use of gas lights. Their sponsorship proved fruitful and there is many a gas light in residential sections to bear out this statement.

But gas companies themselves perhaps haven't taken full advantage of the inexpensive and dependable source of light. Ark-La became aware of this fact and installed gas lights in an auxiliary station building. Thus, in event the power fails at night, the gas lights will give enough illumination to work by. What about the fire hazard? So happens the generators and switch gear produce considerable arcing and the only inflammable in the room is fuel gas which is well contained in steel piping.

Credit for thinking this one up goes to J. E. Waugh, superintendent of the company's Buckley, La., station.

Idea from Arkansas-Louisiana Gas Co.

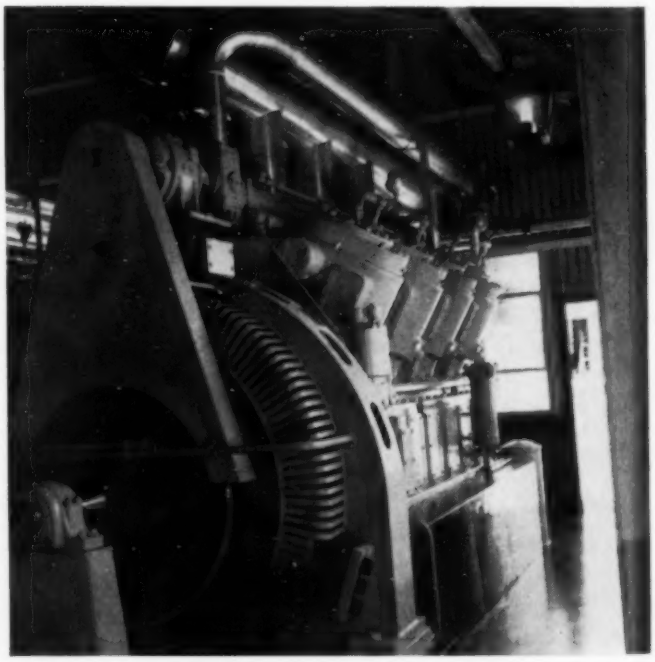


FIGURE 14—**Gas light in auxiliary room. Dependability of gas light can be very important in event of power failure. Cost is low.**

14. Clean Exhaust Ports in 3 to 5 Minutes

With ten 350-hp engines which may require cleaning of all exhaust ports every three months, J. C. Blackshear of Ark-La's Waskom, Texas, station devised a simple method of cleaning the ports in 3 to 5 minutes. The previous method started with pulling the heads on all cylinders and it took several hours to complete the job. But with a "flashlight" made of flexible conduit and an "S"-shaped piece of ⅜-inch pipe with a short length of

FIGURE 15—**Cleaning exhaust ports** of carbon in a matter of minutes. When fuel valve cap and spark plug are removed, the file in "S" shaped pipe can be used to scrape out carbon in 3 to 5 minutes.

round file in one end, the job is simplified. First, the fuel valve cap and spark plug are removed, then the file on the end of the pipe is worked to ream out the carbon in the exhaust ports. The flashlight is nothing more than a bulb in the end of a length of flexible conduit with wires running to a dry cell on top of the engine.

Idea from Arkansas-Louisiana Gas Co.

15. Chain Hoist, Piece of Pipe Make Excellent Compressor Valve Cap Lifter

At Ark-La's Buckley compressor station the device is referred to as a "Johnny-Bill." Reason? The two men who worked out this excellent compressor valve cap lifter were named Johnny and Bill.

Essentially, this is a simple, but ingenious tool. Made of one-inch pipe, it has two eyes which fit the hook on the hoist.

Idea from Arkansas-Louisiana Gas Co.

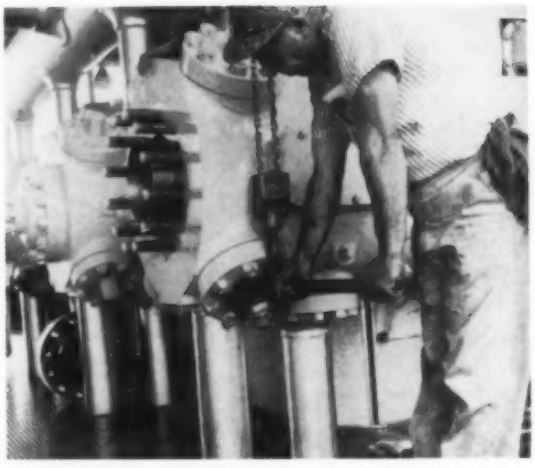


FIGURE 16—**Compressor valve cap lifter** is made of piece of pipe; two eyelets and small hoist.

16. Tip on Handling Electric Motors

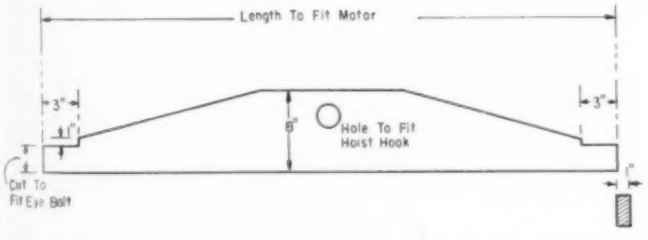


FIGURE 17—**Electric motor lifter** made of 1 x 8-inch length of steel plate.

A lifting bar cut from one-inch plate eight inches wide can simplify the maintenance of electric motors. The bar should be sized to fit individual motors.

Pipe line belt sling makes it easy and safe to handle electric motor rotors. The belt should be for small diameter pipe so it will fit the rotor snugly.

17. Tips on Meter Maintenance

For replacing rotors in meters, use a bar with an offset in it to prevent mashed fingers. It is easily constructed. Simply weld two lengths of pipe to a "U"-shaped strap steel with a hole in the center.

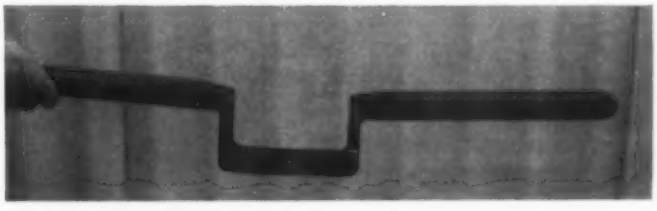


FIGURE 18—**Offset handle** saves fingers in changing meter rotors.

Refinishing meter blades. First, cut a six-inch-wide by 3-foot long section from 1¼-inch plate. Then bore holes and mount angle iron guides on the plate as shown. The latter are detachable, making it possible to remove them and clamp emery cloth beneath them. The meter blades are pushed back and forth and the emery cloth refinishes the worn ends.

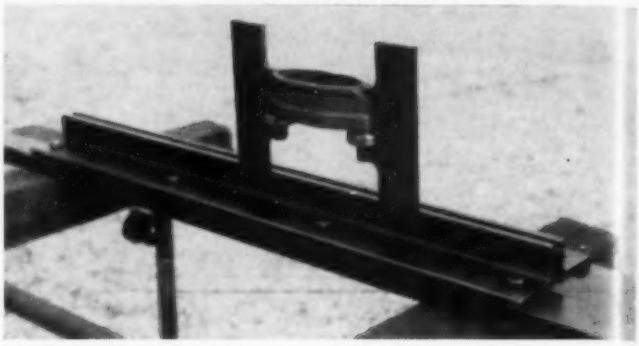


FIGURE 19—**Refinishing meter blades using guide and abrasive cloth.**

18. To Install Road Casing After Line Has Been Constructed—Hinge It

Using the cutting template shown above, cut one side of a road casing apart longitudinally for its entire length. Turn it over and cut the other side, but leave two-inch gaps every 10 feet to serve as temporary hinges. This will simplify the installation of road casing where the pipe line is already in place and the casing must be pieced around the line.

When the open casing is in place, a winchline or boomers will pull it back to its original shape ready for welding.

Credit for this idea goes to T. A. Shedd, Maintenance foreman, Kansas City.

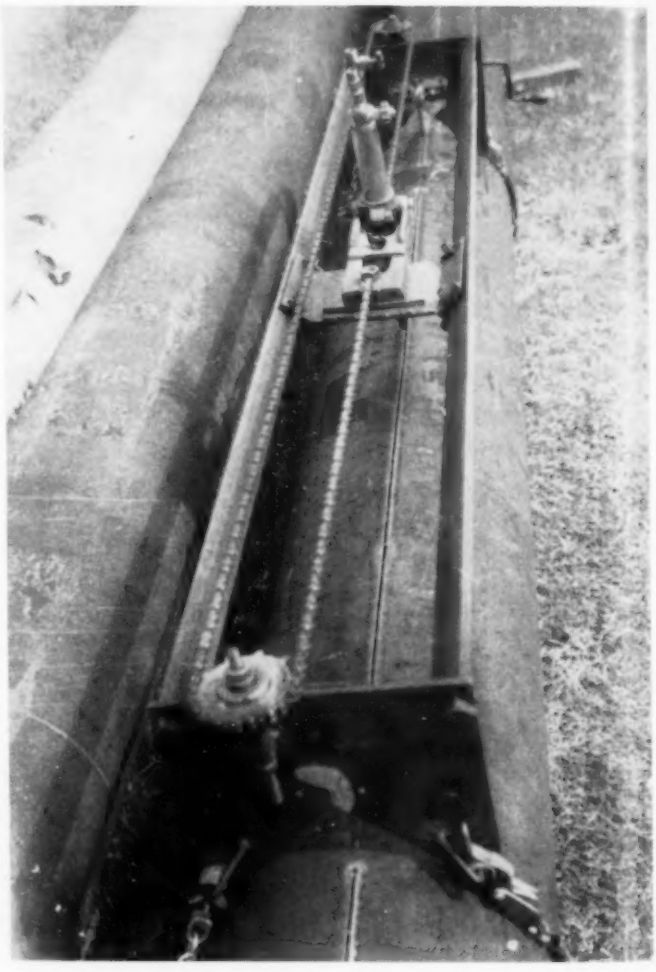


FIGURE 20—**Cutting casing longitudinally but leaving gaps on one side to serve as hinges.**

Some of these ideas may or may not be original. Many companies faced with similar problems may have come up with similar answers. In any event, the chances are that most of them will be new to most of the readers.

The editors of PIPE LINE INDUSTRY plan to make the publication of such ideas an annual affair. So, save these pages, and in a year you will have additional pages to add to them. Meanwhile, should you have ideas which may be novel and helpful to other pipeliners, send them to PIPE LINE INDUSTRY.

ACKNOWLEDGMENT

The editors are grateful to the many companies who contributed to this feature.

Share those good ideas and make money, too . . . . .

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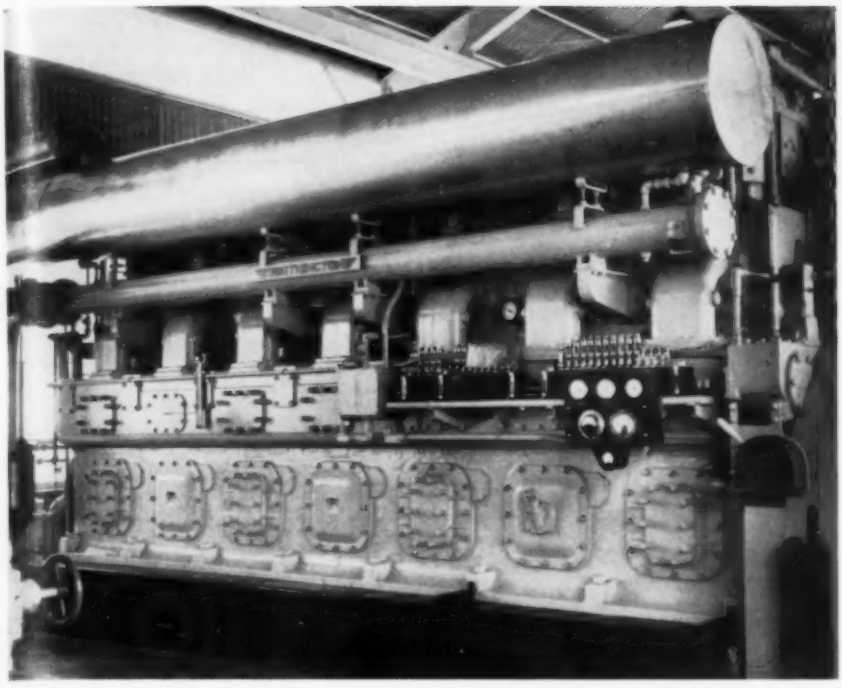


FIGURE 1—This 1,400 hp UTC compressor at Ark-La's Buckley, Louisiana station has operated 20,439 hours without lubrication of compressor cylinders. It handles clean, processed pipe line gas. Initially, compressors were broken in with a small amount of lubrication.

FIGURE 2—Upon inspection following over 20,000 hours non-lubricated service molybdenum disulfide impregnated rings showed only 0.003 to 0.006-inch wear.

Ark-La Gas Completes Four Years Operation With Non-Lubricated Compressors

Molybdenum disulfide impregnated rings and packing run cooler; lubrication costs and chores have been reduced

By P. J. Chandler, Superintendent of Compressor Stations
Arkansas-Louisiana Gas Co., Shreveport, La.

FOUR YEARS AGO Arkansas-Louisiana Gas Company began use of liquid molybdenum disulfide in compressor lubricators for break-in. In early tests of the liquid "moly," packing ran much cooler than normal, so it was decided to equip a field compressor unit with molybdenum disulfide impregnated micarta rings and packing. During the break-in period, lubricating pumps on the field unit were operated for several hours and then the oil was cut off. Inspections later showed that there was less wear on the moly equipped cylinder than on those other cylinders that had received conventional lubrication.

Ark-La's next step was to test out the moly impregnated rings and packing on main line compressors. This has given very good results; some 100 non-lubricated compressor cylinders are now in operation. There have been only three liner failures of which two were caused by cylinders receiving damage by highly abrasive aluminum oxide dust carried over from a dry type dehydrator upstream. Dust filters were installed to eliminate this problem. Another failure was on a compressor equipped with a glass fiber dust filter. Excessive oil from the pipe line carried fine oxide dust through this filter to the compressor. Since this early failure, oil and dirt carry-over has been diminished and there has been no further trouble.

Case 1—Main line station service. During recent overhaul of a unit at Ark-La's Buckley, La., station the moly-micarta rings and packing were examined following three years of service. At time of inspection these rings and packing had been operating 20,439 hours in a 1,400 hp UTC compressor. Inspection showed only 0.003 inch wear on liners and from 0.003 to 0.006 inch on rings during this 3 year period.

This main line station compressing into a 20-inch line handles clean, processed pipe line gas. Compression ratio is normally of the order of about

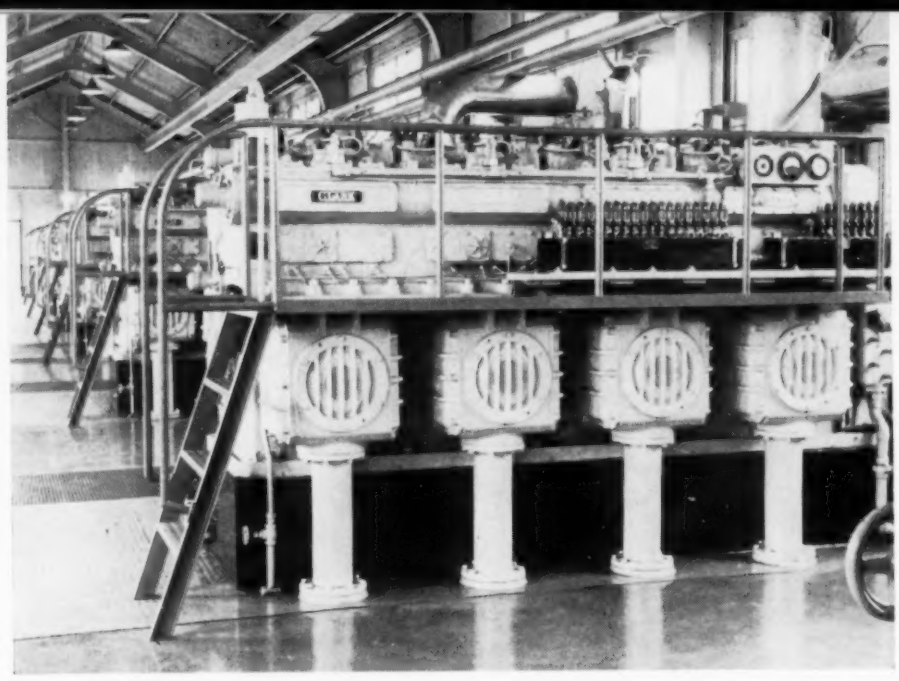


FIGURE 3—These 330-hp HMA compressors at Waskom state line station have been operating without lubrication for over two years. There has been no problem of distillates carrying away molybdenum disulfide from contact surfaces. Compressors were broken in with normal lubrication and periodic lubrication has been used during periods when heavy salt build up occurred on rods, liners, and valves.

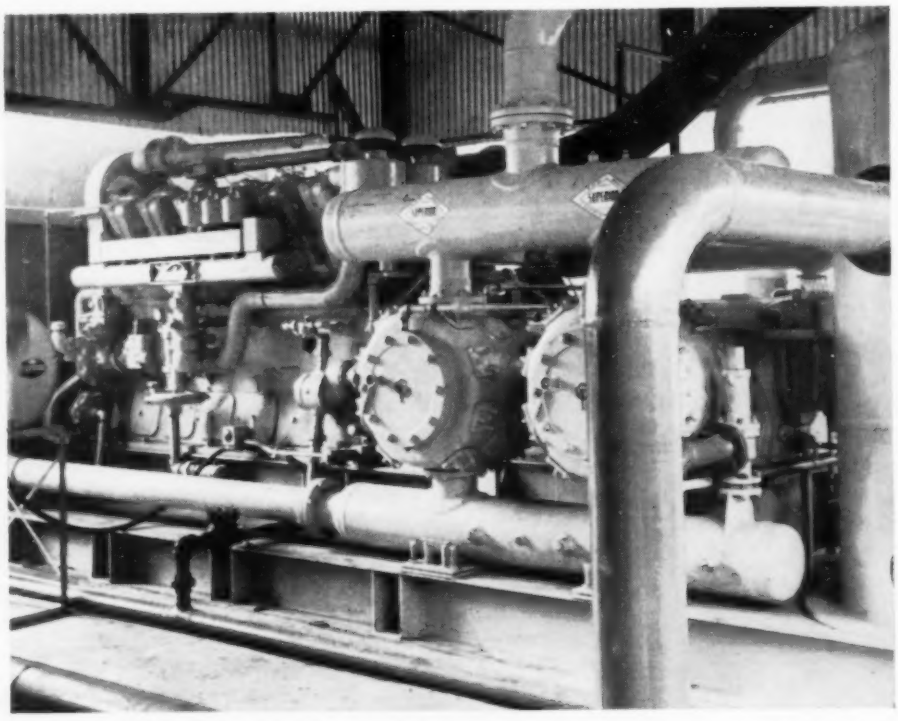


FIGURE 4—Arkansas-Louisiana has had skid mounted compressors operating without lubrication for periods up to two years. Units have ranged in horsepower from 30 hp up to 750 hp boosters. Here a new type four compressor cylinder, balanced-opposed horizontal high speed direct driven unit is being broken in; it will operate without lubrication.

2.5 with a suction of 350 psi compressing, into a discharge of 870 psi. Compressors were broken in with a small amount of lubrication and then run dry. There was an oily film in the compressors from the pipe line gas.

Compressor rod packing on these units was of the same material; it had been running dry for the same period. Upon inspection following the three years of service, it had only the normal amount of wear and went back into service after cleaning and inspection.

Case 2—Wet field gas compressors. Moly impregnated rings and packing have been used in some compressors for up to three years in wet field gas service. In a typical example the Waskom, Texas, State Line station, the 330 hp HMA compressors have been operating non-lubricated for over two years with generally successful results. There has been no problem with distillates carrying away molybdenum disulfide from the lubricated surfaces and as in the case with main line service the compressors were broken in with normal lubrication. Compression ratios are around 2.0.

Salt build-up problem. In the wet field gas compressors, the only major problem using the non-lubricated packing and rings has been that of heavy salt build-up on rods, liners and valves which eats out the packing and rings, in some cases with packing going out in as short a period as only one day. However, even conventional lubrication systems have not met with success under such conditions.

When heavy quantities of salt come through with the gas, operators have tried to work out the deposit by turning on lubrication for a short period of time and running packing and rings with lubrication until the salt problem is passed. Wear in these particular compressors has also been less than with lubricated cylinders under normal operating conditions.

Case 3—Field booster units. Skidmounted booster compressor units have been operating without lubrication for up to two years by Arkansas-Louisiana. These units have varied from 30 hp up to 750 hp units, including some four cylinder, balanced-opposed, horizontal high-speed direct driven Compressor units that have just been placed in service. All of the compressor rings and packing on these are moly impregnated Micarta and will run non-lubricated from start up of service.

What is moly? Molybdenum disulfide, chemically MoS_2, is a laminar type solid similar in structure to such other laminar solids as graphite, mica and boron nitride. Graphite and some of the soft metals such as lead, tin, zinc and copper have long been used for their lubricating properties and although moly's lubricating qualities have been known for years, it had not been generally available commercially before 1948.

Molybdenum disulfide has a low coefficient of friction with a tendency to plate or adhere to wear surface. It will withstand temperatures of 600° F without oxidation and is generally inert and non-volatile. It is versatile

as a powder and can be blended with oils or greases, or impregnated into various materials such as Micarta, a cellulose, glass asbestos or synthetic fiber bonded with phenolic or melamine resins. This has been the form Arkansas-Louisiana has used generally. It can also be baked on metallic surfaces using a suitable binder.

Rings and packing used by Ark-La have been manufactured of Micarta, a product of the above type which has been impregnated with molybdenum disulfide. This is on custom order from one of several leading manufacturers. Generally these rings and packing cost about 20 percent to 25 percent more than the standard Micarta material. Teflon rings and packing have also been used in non-lubricating compressors, but generally it requires piston wear rings which with the high cost of the material make it an expensive installation. Graphite or carbon rings are also used in this service but again high cost and in some cases short life limit their use to special services.

Compressor pistons and liners can also be coated with molybdenum disulfide material by a specially controlled heating and baking process. However, this is expensive and in addition to the cost of application, the compressor would have to be out of service for an extended length of time during application.

Advantages of the Moly lubricated rings and packings. The principal advantages of the molybdenum disulfide impregnated rings and packings are fairly obvious. There is the reduced cost for lubricating oils, the virtual elimination of oil carryover, and the decreased maintenance and operating chores involved with lubricators. It reduces the contamination by lubricating oil carry over into down-stream dehydrator beds; and although it has not been proved conclusively there may be some increase in compressor efficiency as well because of the cooler running of packing rods and liners.

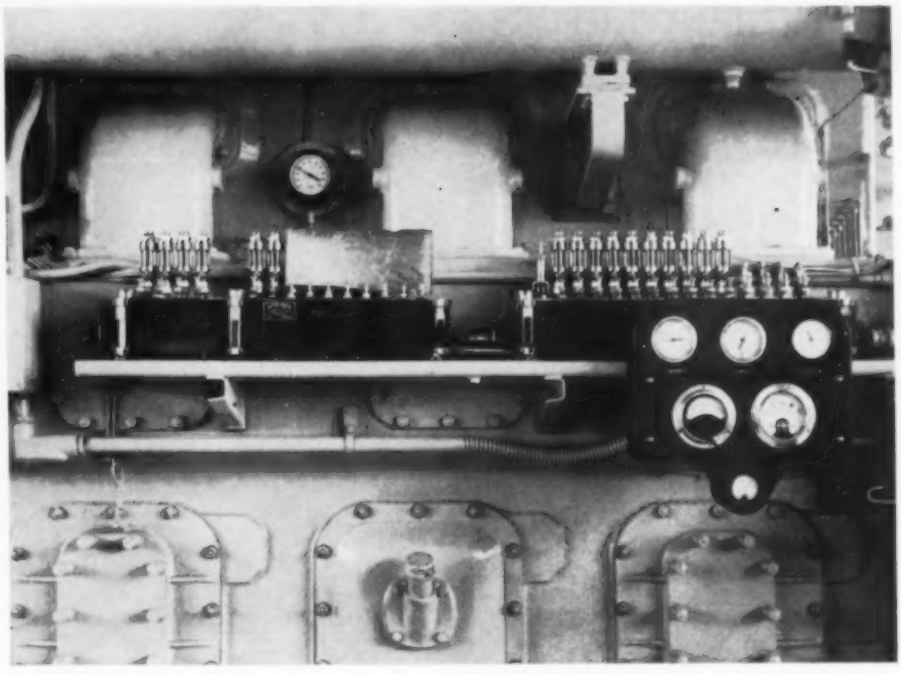


FIGURE 5—Lubricator bank on one of Ark-La's 1,400-hp UTC compressors. Paper "cap" has been placed over those glasses that are not now being used. Compressors were broken in with lubrication and provisions are retained for future lubrication should conditions require it.

Non-lubricated bugs to watch for. The molybdenum disulfide impregnated packing has not in all cases given as good service as has been experienced with the similar material in piston rings. In some instances there has been more blow-by than with lubricated packings and in several cases the packing failed sooner than occurred on adjacent lubricated packings.

As mentioned before, large salt deposits have created some problems. In another case, rings were lost because of excessive pipe line dust which proved to be finely carried deposits of iron oxide. Of course, the 20 to 25 percent higher costs for the impregnated rings and packings increase original equipment costs.

Good wear records. As was mentioned in Case 1, one 1,400 hp Ark-La unit showed wear of only 0.003 inch on liner and 0.003 to 0.006 inch on rings during a period of 20,439 hours upon inspection.

At another station cylinder wear with lubrication averaged about 0.003 inches of wear in the first 10,000 hours of operation as compared with only 0.0005 inches of wear with molybdenum disulfide impregnated rings and no lubrication. A field compressor handling a combination of oil and gas well gas had 0.0015 inches of wear in the first 8,000 hours of operation.

After 16,000 hours total operation the cylinder was again checked and the wear rate was found to be the same as on the initial inspection.

The End.

About the Author

P. J. Chandler, superintendent of compressor stations, Arkansas-Louisiana Gas Company, has wide experience in compressor engineering and operations. Following graduation with a B. S. degree in electrical engineering by Iowa State College, he worked with Natural Gas Pipeline Company of America from 1934 to 1937. Since that date he has been with Ark-La and is now also serving as Assistant Superintendent of the Gas Pipeline Department. Chandler is active in several professional and industry groups including the American Petroleum Institute and the American Society of Mechanical Engineers; he is presently serving on the AGA Subcommittee on Compressor Stations.

Bags filled with dry mixture of cement and sand. Altogether, 17,615 bags were placed under and around exposed and suspended pipe, forming a triangular wall section in river bottom.

Sandbagging worksite on Iowa side of river near Muscatine. Bags were loaded into assault boats (foreground) after chute slide from levee. Assault boats delivered bags to divers' boats.

One Solution to a Scouring River

When the Mississippi River scours threatened eight underwater crossings, pipeliners filled the scours with burlap sacks of sand-cement mix

WHEN SCOURS in the Mississippi River bottom threatened eight submarine crossings, Natural Gas Pipe Line Company of America resorted to an unusual low-cost maintenance procedure which thus far has proved highly successful. After divers had located and plotted the individual scours, NGPL pipeliners anchored a workboat upstream from the line, rigged an underwater trolley from the boat to the affected pipe span and guided burlap sacks of sand and cement mixture to the bottom where divers interlaced them beneath the pipe to fill the scour and support the line. The sand-cement mixture in the sacks started setting up within an hour after submergence. The resulting barrier has seemingly stopped the scouring action in its immediate vicinity.

This operation started last December when NGPL's new loop was tied into eight existing crossings under the Mississippi River near Muscatine, Iowa. Because this expansion upped the throughput requirements of the crossings to about 700 MMcf per day, NGPL engineers decided it would be well to inspect the crossings with an eye toward insuring their continued uninterrupted service.

Six of the lines were 12-inch which had been laid beneath the river bottom 28 years earlier in 1931. The other two lines were 22 inches in diameter. They had been laid downstream from the earlier crossings in 1948. All of the lines had been laid originally in dredged excavations with five feet of backfill in the sand and gravel river bed.

Diver Inspection. The job of inspecting the lines was contracted to Logan Diving and Salvage Company of Jacksonville, Fla. But this work was hampered by low visibility. At a depth of 20 feet the visibility in the river was near zero, and divers had to rely solely on inspection by feeling.

Four divers, wearing insulated rubber suits and face masks which were supplied with air from tanks in a work boat, were lowered to the river bed to walk and feel every foot of the underwater right-of-way. In this instance the divers found that four of the 12-inch lines and one 22-inch line were undermined for distances ranging from 8 to 134 feet. The maximum depth of the scoured areas was about 6 feet below the pipe.

Where the lines were exposed, the divers carefully felt for signs of corrosion, sand abrasion, chafing by debris, and more important, for signs of fatigue. When pipe lines are undermined by the river, the suspended span tends to vibrate and cause eddy currents which, in turn, cause more scouring and expose more line. In several instances, the scours left unsupported spans saddled with river weights which could cause undesirable stress concentrations. However, in this case the damage to the coating and pipe appeared negligible; the suspensions apparently had not been of long duration.

After the profiles of the bottom had been plotted, the company decided to

Here workmen attach bag to cable from boat to pipe line. Guided lowering prevented sacks from being washed away by current. Within an hour after bags were set in place, they started hardening.

Diver in rubber suit and face mask prepares for the 20-foot dive in 50-degree water. Divers were supplied compressed air from tank in boat. They worked in two-hour shifts.

reinforce the lines at five points. Four were on 12-inch lines; one spot was on a 22-inch line. The most practical method of accomplishing this appeared to be sand bagging.

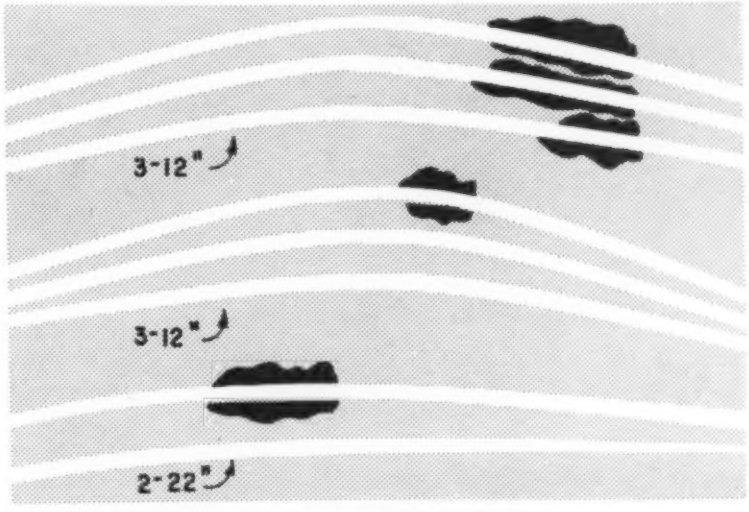
Placing Concrete Cushions. Buoys were clamped to the pipe at the trouble spots, and cement-sand mixture was ordered to the job site. It was delivered dry by ready-mix trucks in a 3-to-1 ratio. The material was sacked in burlap bags on the levee and loaded onto a barge. Meanwhile, a workboat had been anchored upstream from the suspended section of line. A wire rope was connected to the pipe and the burlap bags were trollied from the boat to the scoured area in the 20-foot-deep water.

Two divers, working two hour shifts in the 50° F water, interlocked the bags beneath the pipe to form a triangular section which filled the scour and braced the pipe. Within an hour after submergence, the sand-cement mixture began to set up.

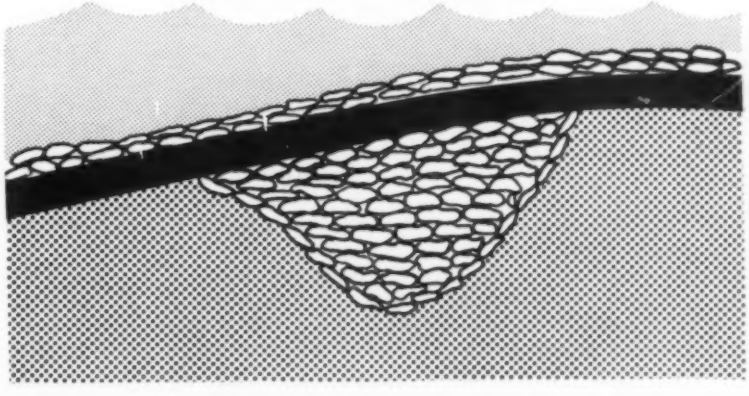
A total of 17,615 bags was used in this manner. The job required eight days from start to finish. Upon completion, NGPL engineers breathed easier. For the time being, they feel, their troubles with the river have been arrested.

ACKNOWLEDGMENT

Photos and drawings are from Natural Gas Pipe Line Company's *Between the Lines.*



Plot showing the five scoured areas in the eight-line crossing. The length along the pipe line varied from 8 to 134 feet. Depth below the pipe ranged to six feet.



How the bags were interlocked beneath, over, and around the pipe. In cross-section, the bags formed a triangular wall at right angles to current flow.

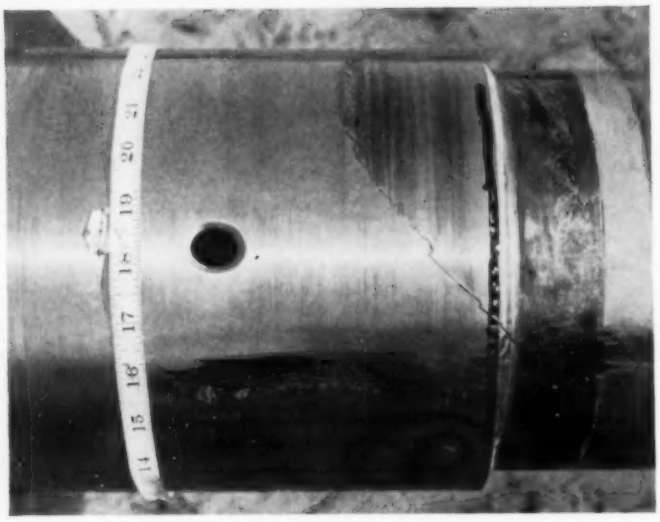


FIGURE 1—Crankshaft failure caused by liquid carryover to the compressor cylinders.

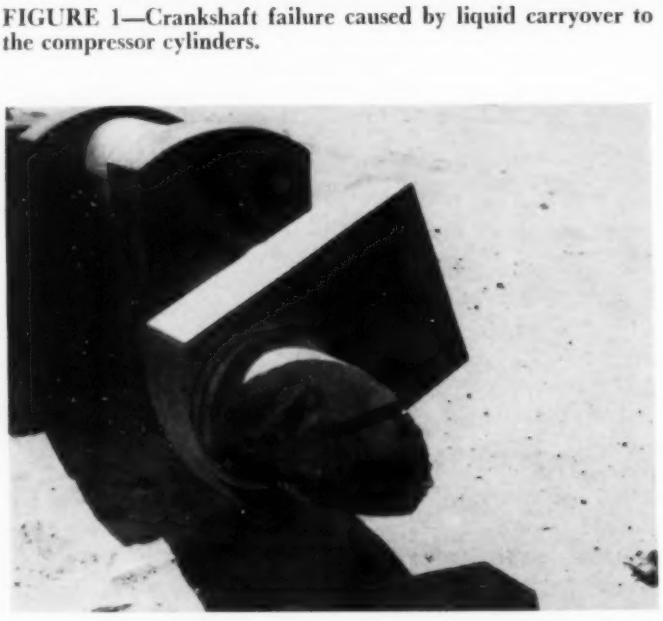


FIGURE 2—Second cause of crankshaft failures. There was stress concentration or notch effect inherent in the design of the shaft.

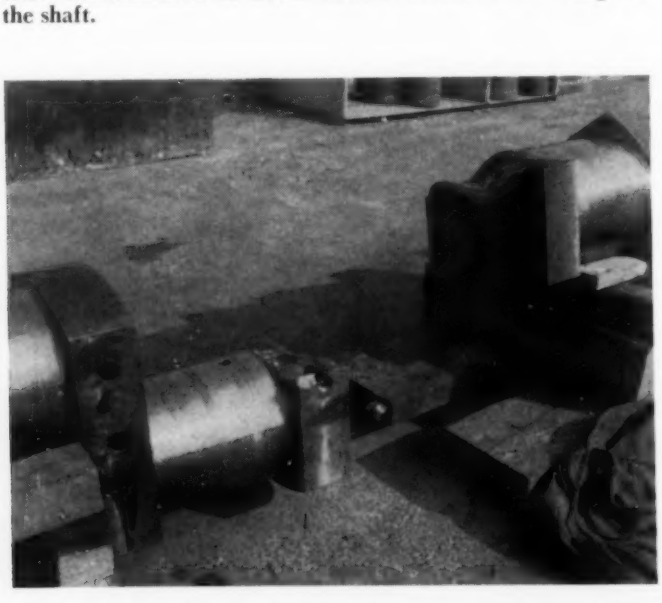


FIGURE 3—Third and most common cause of crankshaft failures stems from excessive crankshaft deflection. This often comes when engine misalignment develops during operation as a result of grout or concrete deterioration.

MAINTENANCE REPORT

Reasons and

Big and costly trouble will result when excessive crankshaft deflections occur

By F. E. Glendening,
Senior Compression Engineer,
Pacific Gas and Electric Company,
Bakersfield, Calif.

IN RECENT YEARS, operators of gas transmission engines have found that something was causing their engines to become misaligned with resulting excessive crankshaft web deflection. Continued operation under these conditions has resulted in complete failures. Numerous crankshaft failures have been made known to us in the gas transmission industry and, beyond a reasonable doubt, there are many that have not been publicized.

It is expensive to re-align an engine; however, the cost to replace a broken crankshaft is by far greater. A known case of a complete failure exceeded a cost of $50,000 to repair. This cost does not take into account loss of production or possible extensive damage to the remaining engine component parts.

Fortunately, most of these failures can be prevented. So let's take a look at some of the causes of engine misalignment and the remedial measures that can be taken.

VARIOUS CAUSES OF CRANKSHAFT FAILURES

Modern production methods virtually eliminate the possibility of a crankshaft failure caused by flaws in the metal. While this may rarely be the cause, this reason is too often given for convenience.

There are several common causes for a crankshaft failure such as *liquid carryover to compressor cylinders, stress concentration or notch effect due to design characteristics, and excessive crankshaft deflection.* Figures 1, 2 and 3 show actual examples of each type failure.

Each type failure is a subject within itself. For this reason, this discussion will be confined to the causes for excessive crankshaft web deflection and the possibility of complete failure.

Remedies for Crankshaft Failures

VARIOUS CAUSES FOR EXCESSIVE CRANKSHAFT DEFLECTION

An engine crankshaft can be considered as a continuous beam, with a number of supports (*bearings*) located at intervals along its length. If for any reason this beam (*crankshaft*) is being supported either higher, lower, or to either side as related to its center line, a web deflection will result in 180° of rotation. A tensile stress will be created in one side with a compressive stress in the opposite side. These stresses are reversed as a shaft is rotated.

Assuming deformations are within the elastic limit, applying Hooke's law, *stress is proportional to deformation.* In simpler terms, this means that as a body is deformed or deflected away from a zero point, the force required to cause the change is likewise increased. Therefore, the greater the deformity, the greater the unit of stress within the body.

The above theory is applicable to our compressor engines. The engine frame or crankcase will deform in relation to its support or foundation. An engine crankshaft, in turn, will deform in relation to its support. This deformation or deflection causes stress reversals as the crankshaft rotates.

The failure of a crankshaft is dependent upon the amount of stress developed and the endurance limit of the metal. It is well to note that a crankshaft, in the static state, may not follow the contour of the bearings; consequently a web deflection test can be misleading unless the total potential deflection is obtained. With this in mind, the relationship of engine mis-alignment and excessive crankshaft web deflection can be established.

CONCRETE GROWTH

Modern compressor stations usually contain a number of large engines. Each is grouted on a foundation block which contains approximately one hundred cubic yards of concrete. In designing these blocks standard practice has been to specify a concrete mix that would give an acceptable compressive strength. In so doing, the quantity of cement, sand, aggregate, and water is reasonably controlled. After a predetermined curing time elapses, the engine is leveled on top of the foundation and grouted with a mix of cement, sand, and water.

After a period of operation, cracking and spalling of the concrete foundation may become evident. Some may consider this to be the result of concrete shrinkage and heat. But this condition is usually accompanied by a distortion of the engine and evidence that mis-alignment is occurring. Grout deterioration could account for this. When the condition warrants action, regrouting appears to be a simple solution; however, not necessarily a permanent one. There is a relatively recent explanation that may apply where the foregoing assumptions fail to be valid. The proper explanation could be concrete growth, or, in other words, *alkali-aggregate deterioration.*

It may come as a surprise that there is not an abundance of technical information on the subject. There still remain many questions to be answered before reliable detailed data are available. However, there appear to be sufficient data that make possible a reasonable explanation of the phenomenon.

Alkali-aggregate deterioration of concrete is the result of reaction of free alkali in the cement with finely divided or amorphous silica. The expansion caused by this reaction is influenced by many factors. The more important are alkali-content of the cement, temperature of curing, available moisture, cement content of the concrete, and the amount, size, and reactivity of the aggregate.

Alkali-content. To remove the alkali factions from the cement would make the cost of the cement excessive when used in large quantities. Cement having an alkali content of less than 0.60 percent is considered to be reasonably trouble free. However, experiments indicate reaction occurs when the alkali content is as low as 0.40 percent. In our experience actual mill tests of a certain Type No. 1 cement for a seventy-two month period indicated the alkali content varied between 0.49 percent and 0.79 percent. For 60 of the 72 months, the 0.60 percent limit was exceeded.

Aggregate. Siliceous rocks, in the past, have been considered acceptable aggregate for concrete. However, many of these are reactive. If amorphous silica and sodium and potassium oxide are present in the cement in excess of a 0.60 percent, alkali-aggregate reaction is possible.

Water source requirement for the reaction. There is a variance of opinion as to the quantity of water required for the reaction and the source of the water. The quantity of water required for mixing and placing of concrete is far greater than the amount required for complete hydration of the cement. This appears to be one source of water for the reaction.

Experiments indicate that test bars made from reactive materials, expand when subjected to the normal atmosphere. Water vapor from the air then becomes a second potential source of water. Too, there are water leaks from the engine etc. Thus, there is water available for the reaction from several sources.

At this point it would appear that if the three necessary requirements were present, excessive concrete growth would be a certainty. This fortunately is not correct. It was previously stated that the amount of reactive aggre-

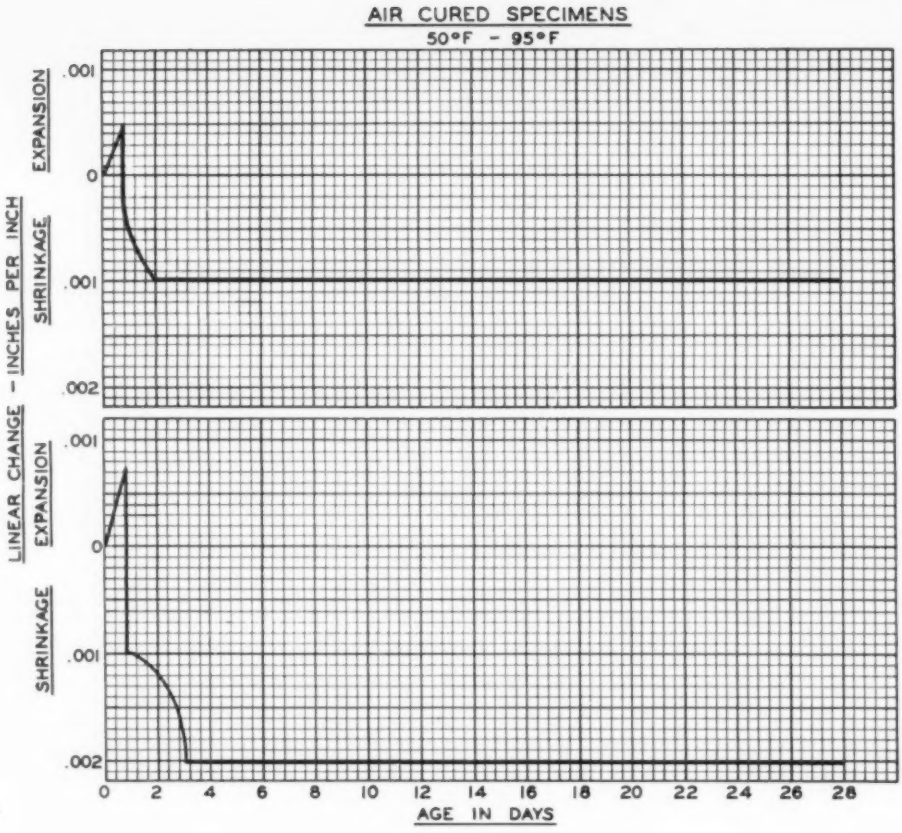


FIGURE 4 (above)—Shrinkage of two metallic grouts, air-cured.

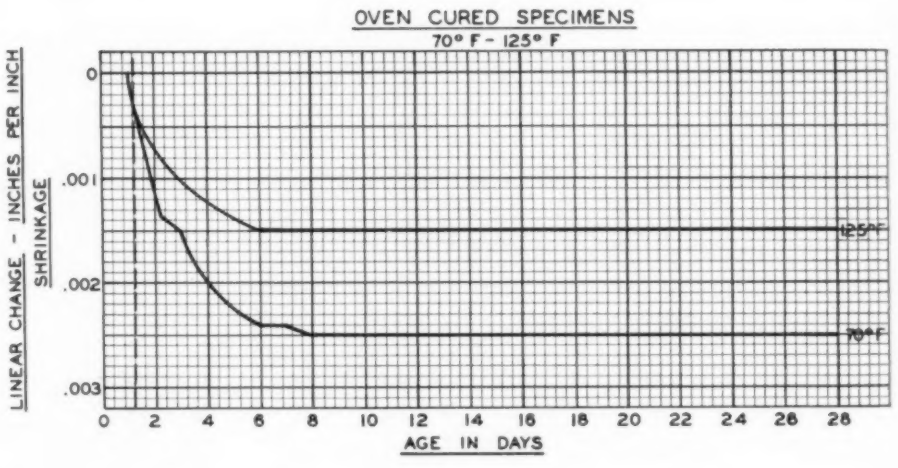


FIGURE 5 (right)—Shrinkage of a metallic grout, oven-cured.

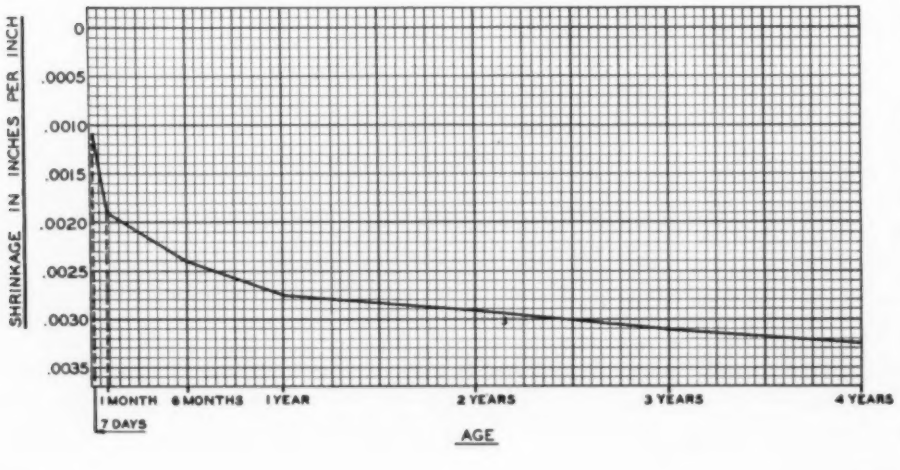


FIGURE 6 (below) — Shrinkage of cement paste.

gate could influence the concrete expansion. For this reason, each type of reactive material has an optimum quantity necessary to produce a maximum expansion when the other conditions remain constant.

Alkali-aggregate deterioration in a concrete structure causes internal stress and pressure. Spalling and cracking are two outward indications of this phenomenon. Dimensional distortion can also result. As much as a 0.5 percent dimensional change has been noted and there is no assurance that the changes will be proportionately equal throughout the three dimensions of a concrete compressor engine foundation.

Experience on one type of our engines indicates that elevation differences along the foundation top surface of about .025 inch will cause a .005 inch crankshaft web deflection. It is not difficult to see that a change, anywhere near 0.5 percent, cannot be tolerated.

Solution. Concrete growth or expansion can be alleviated in structures by the addition of reactive pozzolans. It would appear to be in order to alter present concrete specifications for use in critical structures as a deterent to this problem. If specifications required testing of the cement and aggregates for the possibility of alkali-aggregate reaction, the necessity for the addition of counteractive materials could be decided in advance. It is needless to say that a decision is too late after the damage is done.

GROUT SHRINKAGE

An engine to be grouted for the first time is leveled about two inches above the foundation and the void filled with a grout mix consisting of sand, cement, and water. To reduce shrinkage, the mix is made with as little water as possible yet fluid enough to permit complete placing. In some cases, dry cement is tamped into the mix after placing is complete. The method is essentially the same when regrouting an engine. However, it is often necessary to remove a portion of the top surface of the foundation, because of oil soaked concrete and to obtain adequate roughness for a good bond.

Since a minimum of shrinkage is desirable, the use of metallic type grouts has become common in recent years. The manufacturer's literature implies that the mix is non-shrink. This point is questionable. Figure 4 indicates the dimensional change that occurred in two metallic grout mixes that were air cured. Figure 5 indicates that there is a difference in the dimensional change when a mix is oven cured. Figure 5 is plotted for the grout mix shown in the upper half of Figure 4.

The shrinkage characteristics of the grouts shown in Figures 4 and 5 are for a relatively short laboratory test period. Excluding other factors, the cement paste is the material in both concrete and grout that affects the shrinkage. Figure 6 indicates the shrinkage characteristic of cement paste for an extended period.

Shrinkage of grout would not normally be of serious concern if the total shrinkage were uniform. This is very unlikely, in actual practice, because of the lack of uniformity in the thickness of the grout itself. This is particularly true of engines that have been regrouted. A variation of six inches in the thickness of grout is not uncommon. Considering, as indicated by Figure 5, that up to .0025 inch/1.00 inch of thickness shrinkage may result, this rate must be multiplied by the differential thickness involved. Your attention is called to a previous statement relating our experience wherein a vertical change is in a ratio of about 5:1 with respect to crankshaft deflection. This relationship and the applicable web deflection figures are indicated in Figure 8. The problem does not stop at this point. Due to the increased loading of the high points, the grout is subjected to powdering and ultimate deterioration.

DIFFERENTIAL TEMPERATURES

A concrete engine foundation is subjected to two principal temperature sources. The first is ground temperature; the second, the temperature of the engine crankcase. Concrete expands and contracts with a change of temperature. Using, for discussion purposes, an arbitrary 60° F ground temperature and 170° crankcase temperature, a 110° F differential temperature would exist between the top and the bottom of a foundation. This assumption is not completely true, the heat transfer between the crankcase and the foundation, is not 100 percent, but it does serve as an example.

When heat transfer takes place, the top of the concrete mass will elongate with respect to the bottom. With the elongation, the mass will also mushroom or crown as internal pressure is increased. The engine frame will cold flow and attempt to follow this contour. This causes the center of the engine crankshaft to become relatively higher than the ends. It has been often stated that an engine operates initially with *minus* crankshaft web deflections when leveled with zero web deflections. The terms *minus* and *plus* are arbitrarily selected to indicate the relative location of the crankshaft in regard to its center line. Noted below are actual crankshaft web deflection readings that indicate the effect of temperature.

Crankcase Temperature	THROW NUMBER				
	#1	#2	#3	#4	#5
90° F	+.0015"	+.0005"	+.001"	+.001"	.000"
140° F	+.0005"	+.0005"	—.001"	—.002"	.000"

From these figures, it can be seen that temperature can affect the crankshaft web deflection readings. A low shaft will be improved while a high shaft will be made worse. When comparing web deflection readings, readings taken at nearly the same temperatures should be used to avoid errors.

BEARINGS

The modern, so-called, precision bearing is made up of a steel or bronze back and a few thousandths of babbitt lining. The thickness of the babbitt may vary but generally is close to .020 inch. If a bearing should fail, part or all of the babbitt may be displaced from the shell. Keeping in mind the 5:1 ratio previously stated, a crankshaft web deflection can result from a bearing failure. This may or may not cause trouble depending upon the total resulting stress.

The older style bearings, having about one-half inch of babbitt, present more of a problem. Since some crankshafts have sufficient rigidity in a static state, a true web deflection may not be evident when a bearing fails, and for this reason the shaft to bearing clearance should be checked. From this data, it can be determined whether the total web deflection is being observed.

VARIOUS METHODS OF CHECKING DEFLECTION AND ALIGNMENT

The amount of crankshaft web deflection and misalignment cannot be accurately determined without utilizing proper and uniform procedures and instruments. Figure 7 shows some of the tools and instruments used in our determinations. These are:

1. A precision tilting level with coincidence bubbles and optical micrometers. Instrument includes precision scales.
2. Inside micrometer.
3. Inside and magnetic attachment strain gauges.
4. Machinist level.
5. Pencil thermometer.
6. Feeler gauges.
7. Flashlights with magnetic attachment.

With one exception, most of the instruments are commonly used and need no further explanation as to

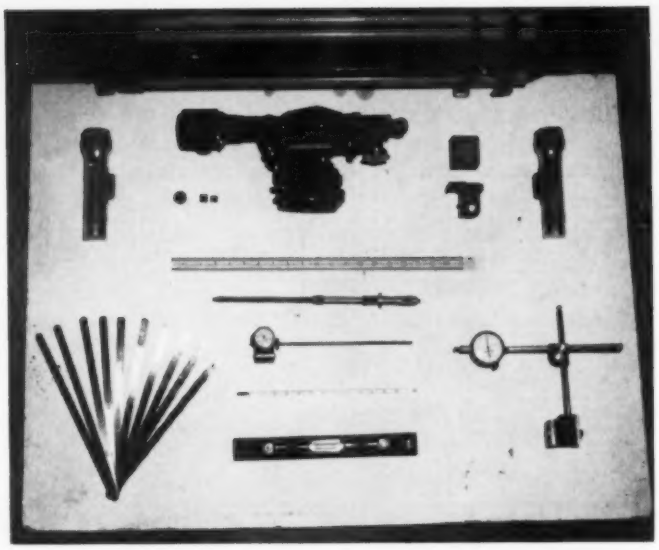


FIGURE 7—Instruments and tools used for checking web deflection and engine alignment. Principal instrument is a precision tilting level with coincidence bubbles and optical micrometers.

their purpose. The precision level may not be as universally known and used.

Figure 8 shows the profile of the bearings of an actual engine before and after regrouting. The precision tilting level was utilized in determining the relation, in elevation, between the bearings. Noted below are the corresponding web deflections.

Before releveling

Crankcase Temperature	THROW NUMBER				
	#1	#2	#3	#4	#5
92° F	*+.002"	+.004"	+.005"	+.006"	+.004"

After releveling

Crankcase Temperature	THROW NUMBER				
	#1	#2	#3	#4	#5
73° F	+.00075"	.000"	—.0005"	+.00025"	—.00025"
83° F	*.000"	.000"	.000"	+.0005"	.000"

* Foundation bolts tight.

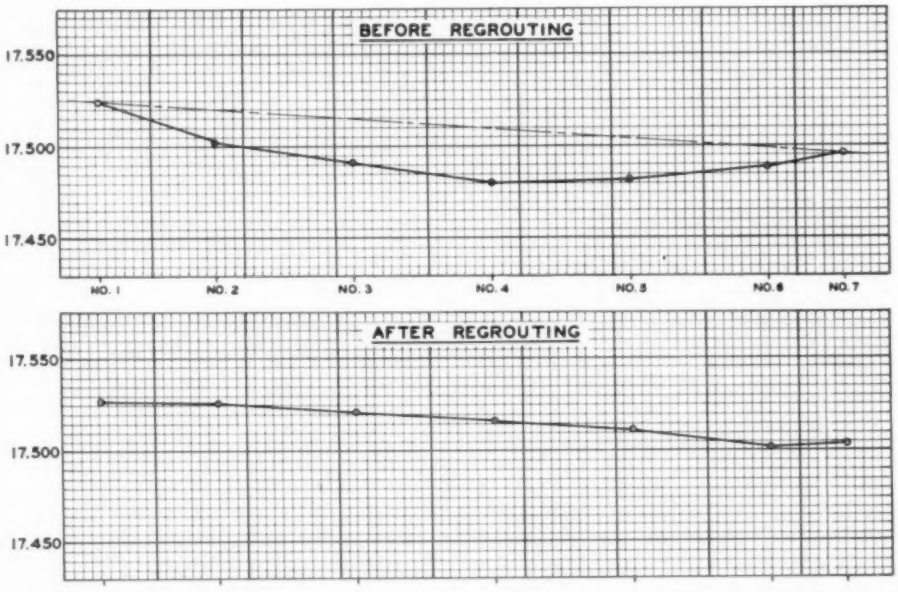


FIGURE 8—Profile of engine bearings utilizing a precision tilting level.

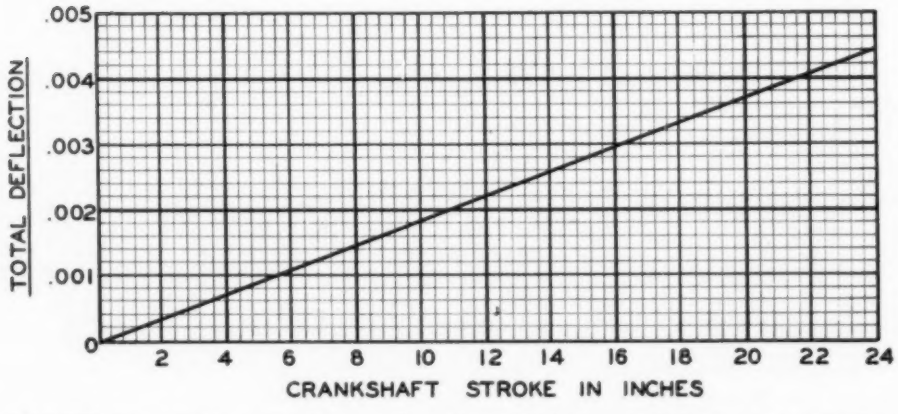


FIGURE 9—A guide to maximum allowable crankshaft web deflection of an engine.

The precision tilting level is accurate, when used by the average skilled operator, to within .003 inch at 50 feet. Due to the shorter distances involved, accuracy to within .001 inch is expected. Since profile readings on an engine might, out of necessity, be taken with adjacent engines in operation, a slight error can occur due to vibration of the instrument. This condition should be avoided if possible.

There is another instrument, called an alignment telescope, that can be used with accurate results. However, it can only be utilized when the crankshaft is removed from the crankcase since it requires a sight line to be established between the center of the first and last bearings. For this reason, the instrument is seldom utilized.

CORRECTIVE MEASURES AND WHEN REQUIRED

It may appear unusual, but it is true, that some engine operators do not make periodic checks of their engine crankshafts for possible web deflection. This might account for some of the failures. One thing is certain, no one will have a problem from excessive crankshaft deflections, unless the possible existence is sought. In this case the problem will only be known after it is too late.

Depending upon the cause, there are several courses of action that can be taken to correct a mis-aligned engine crankshaft. The steps are, first, to determine accurately the extent of the mis-alignment; secondly, to determine accurately the cause, and lastly, to take the necessary remedial measures.

Following this program, some of the causes have been noted along with the essential instruments for determination. Figure 9 has been included, as a guide, for determining when a crankshaft web deflection is considered excessive. Some of the remedial measures are listed below.

ECCENTRIC BEARINGS

While the use of eccentric bearings is not out of the realm of possibility, I, for one, would resort to their use only out of sheer desperation. More than likely, an individually-sized bearing would be required for each half shell throughout the entire engine. The problems in their use would be numerous.

PEENING

Where a bearing is tilted or only slightly low, peening of the bearing structural support can and has been done to bring it into alignment. This should be attempted only by an expert after the necessity has been firmly established.

REGROUTING

Regrouting an engine can be accomplished in essentially three different ways.

1. Raise the engine completely off the foundation, remove the old grout, lower and relevel the engine to the desired height and regrout.
2. Remove all the grout from under the engine crankcase flanges, relevel and regrout.
3. Remove only the grout, from under the crankcase flanges, that is low; relevel and regrout. This method has been termed a partial regrout.

There are advantages and disadvantages to each procedure that must be considered. Briefly these are:

1. The first method is the most expensive because of the time and precautions that must be taken in lifting a 100-ton machine about three feet above the foundation. In addition, all connecting piping must be disconnected. The machine, however, is relatively free of stresses, caused by lifting, when releveled above the foundation.
2. In the second procedure, as the grout is removed, leveling blocks are installed to avoid engine settling. The leveling blocks need only be adjusted to compensate for the mis-alignment. Since localized pressure is necessary, the four corner foundation bolts remain tight. This prevents unnecessary raising of the engine ends. Figure 8 shows the elevation change necessary for the alignment of one engine. Figures 10, 11, 12 and 13 show the location of the various leveling blocks and control instruments. Figure 13 also shows one set of hydraulic jacks that was utilized in breaking an engine loose prior to

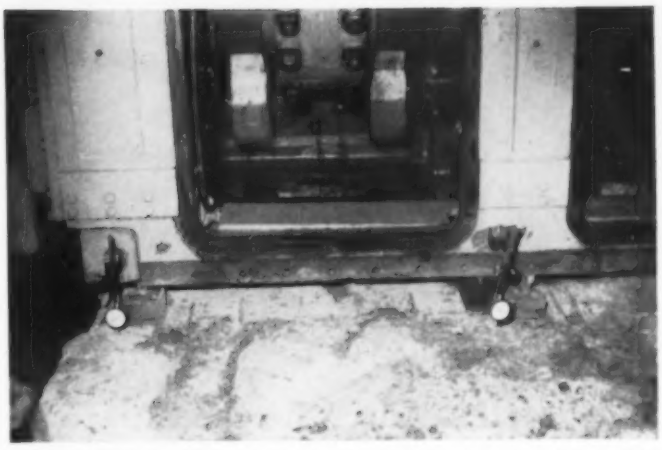


FIGURE 10—Control of end elevation using leveling blocks and dial indicators.

FIGURE 11—Leveling blocks and gages on operating side of engine.

FIGURE 12

FIGURE 13

At left is individual lifting block and instrument. View of compressor side of engine (right) with additional lifting jacks.

FIGURE 14—Regrouted operating side of engine.

FIGURE 15—Regrouted compressor side of engine.

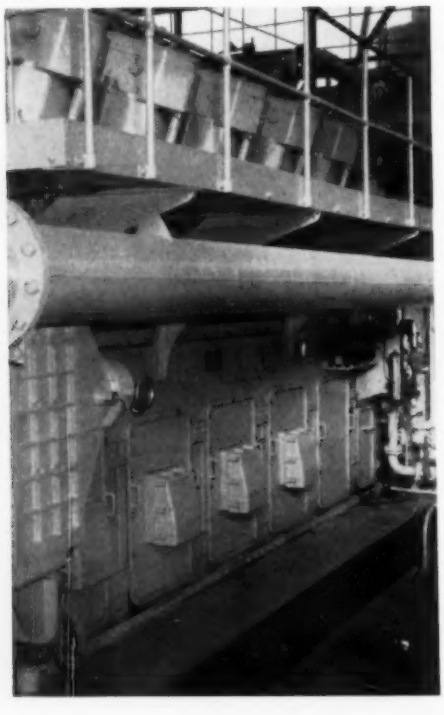


FIGURE 16—Finished job of regrouting engine.

removing the old grout and releveling. Figures 14 and 15 show the rough grout after being poured. Figure 16 shows a completed regrouted engine. This procedure has definite advantages as compared to the first. However, since the engine corner foundation bolts remain tight during the lifting operation, reasonable caution must be exercised to avoid excessive stressing of the bolts and the engine crankcase. Incremental lifts followed by a time delay are suggested.

3. This procedure appears to have its place when complete regrouting is not necessary. The procedure differs very little from that used above. It is important to determine the extent of the grout removal due to the possibility of lifting an engine off of the remaining grout which would result in incomplete engine support.

ENGINE RAILS

A recent development makes it possible for an engine to be realigned with a minimum of effort and time. Steel rails are imbedded in the concrete foundation and the engine aligned, by using chocks or shims, on top of these rails. The method is similar to that used for marine type installations. If an excessive crankshaft web deflection should recur, the necessary chocks need only be readjusted in compensating for the misalignment.

SYNTHETIC GROUTING

In addition to the use of synthetic materials in place of mixes containing sand and cement or metallic grouts, these materials also have a potential in the field of partial regrouting. In theory, an engine need only be raised sufficiently for alignment and this material pumped into the void thus created. In our one experience, the attempt to regrout in this manner was not successful because the synthetic fluid grout did not completely fill the space under the engine. This does not necessarily mean that engines cannot be regrouted in this manner. Further experimentation is required to determine why the synthetic grout did not flow as was expected.

CONCLUSIONS

The photographs taken of various crankshaft failures are graphic examples of unfortunate experiences of another company. These were included simply because many people have never seen a broken crankshaft or the damage that results. To the many engine operators throughout the industry, this is a serious problem.

Periodic inspections to detect, in the early stages, conditions of crankshaft deflection and to take remedial measures, before serious damage has occurred, is recommended.

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ACKNOWLEDGMENT

From a paper presented to the Pacific Coast Gas Association Transmission Conference, May 25-27, Salt Lake City, Utah.

Sandblasting the Top of a Full Crude Tank Is Safe, If . . .

. . . blast crews prevent the build-up of static electricity

By Richard F. Gavitt,
Service Pipe Line Co.,
Tulsa.

EVEN WHEN CRUDE TANKS are full of oil, it is safe to sandblast them if you follow certain field-tested methods which were developed by Service Pipe Line Co. technicians. There's a savings involved because it allows work to be carried out without vapor-freeing the tanks.

The fire hazard inherent in sandblasting has been recognized by the petroleum industry for years. The tests by Service, however, established that the one major cause of hazard is *static electricity*—not heat build-up in the metal nor sparks caused by sand on steel. By an adequate bonding and grounding system, the danger from static electricity can be reduced to safe levels.

These general conclusions are based on lab tests made in the firm's Tulsa shops, and on field tests made on tanks actually in service. In the lab experiments, three specific problems were studied:

(1) Are sparks caused by sand striking metal, and if so, are they "hot" enough to ignite flammable vapors?

(2) When metal is being sandblasted, is the heat build-up high enough to ignite flammable vapors?

(3) What are the static electricity characteristics involved in sandblasting operations?

FIGURE 1—Sizable savings were effected when this 80,000-barrel tank of Service Pipe Line Co. near Longview, Texas, was safely sandblasted while the tank remained full of crude oil. The method of bonding and grounding which made this operation safe, and eliminated the need of vapor-freeing the tank was proved out Service.

LABORATORY TESTS

A miniature tank containing gasoline was used for the lab tests. Several holes were sandblasted in the $\frac{3}{16}$-inch steel tank bottom while a flammable vapor mixture was present in the tank. The heat build-up in the metal was carefully measured, but it did not approach the ignition temperature of gasoline (450-500° F.) and no fire resulted. Neither sparks from the sand nor heat from the metal are sufficient, the test proved, to constitute a hazard.

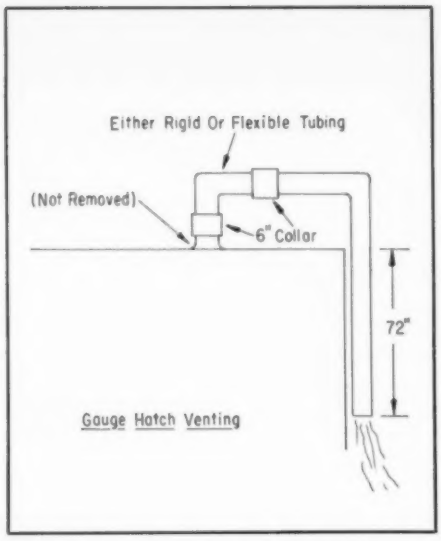


FIGURE 2—Specially designed vent should always be installed in cone-roof tanks before sandblasting. This permits "breathing."

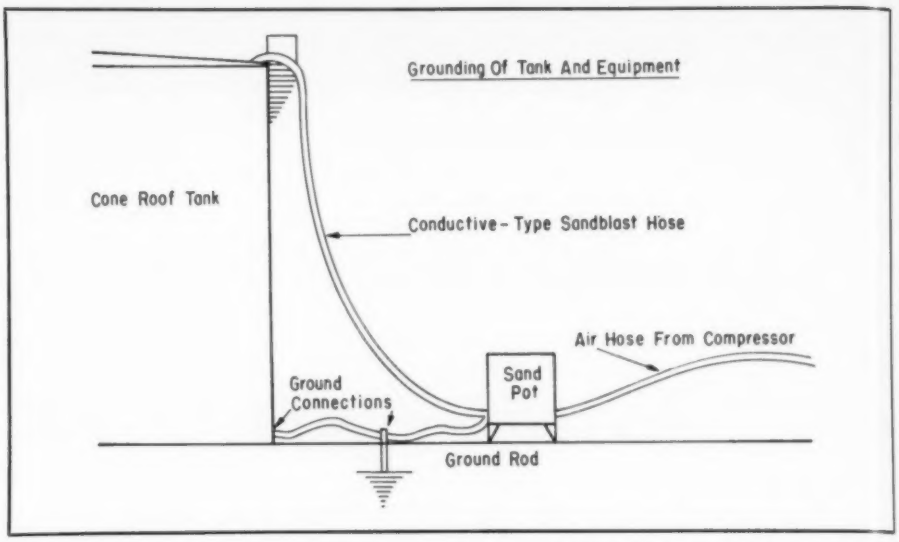


FIGURE 3—Tank and equipment must be grounded to prevent build-up of static electricity. Moreover, the hose should be of a conductive type. A maximum of 25 ohms resistance is permissible.

Static electricity. The presence of static electricity, however, was another thing altogether. Very large charges—more than 30,000 volts in some instances—are created by sandblasting. Unless proper grounding precautions are taken, this can be extremely hazardous.

Using an electrostatic voltmeter, itself grounded to 300 feet of buried two-inch water line, safety personnel were able to measure the voltage generated by a blast of sand on metal. They began the tests with a series of various-sized steel bolts mounted on wooden sticks, ungrounded. The size of the static electricity charge varied inversely with the size of the bolt. Then, by the use of a steel plate on a wooden handle—and later an actual tank—they were able to determine that static charges of many thousands of volts could be effectively and safely controlled by proper bonding or grounding.

In general, the conclusions were that the tank blasting equipment, the operator and the tank should be maintained at the same potential by bonding attachments. If this is done, static build-up — and consequently dangerous arcs—will not occur.

FIELD TESTS

Actual field testing, under the supervision of the safety section of Service, was carried out at the company's Sabine pump station, near Longview, Texas. The floating roof of an 80,000-barrel tank was successfully sandblasted after a careful system of bonding was applied to include such items as the generator, sand pot, hose, nozzle **and the operator himself.**

The project required only a few days, compared with a period as long as several weeks using older methods which necessitated taking the tank out of service and cleaning it before work could begin on the roof.

Combined laboratory and field tests indicate that the following precautions must be observed in the sandblasting of tank roofs in service:

CONE-ROOF TANKS

1. Tank must be isolated by closing valves on all incoming and outgoing lines.
2. "No Smoking" rule must be observed.
3. All fire screens must be in place, all snuffers closed, and all gage hatches closed except one, which must be removed. Gauge hatch covers and other tank appurtenances should be checked to see that they are not leaking. If necessary, water-soaked burlap placed over these openings will give added protection. Sandblasting must not be done on any tank where corrosion has caused leakage.
4. At opening from which hatch is removed, a specially designed vent (Figure 2) should be installed to permit "breathing" of the tank caused by atmospheric changes.
5. Tank and sandblasting equipment must be grounded (not more than 25 ohms resistance)

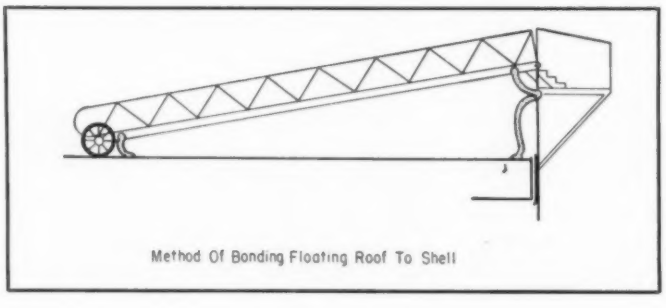


FIGURE 4. Floating roofs must be grounded along with ladder and tank. Even the operator must be grounded to eliminate the hazard of static electricity.

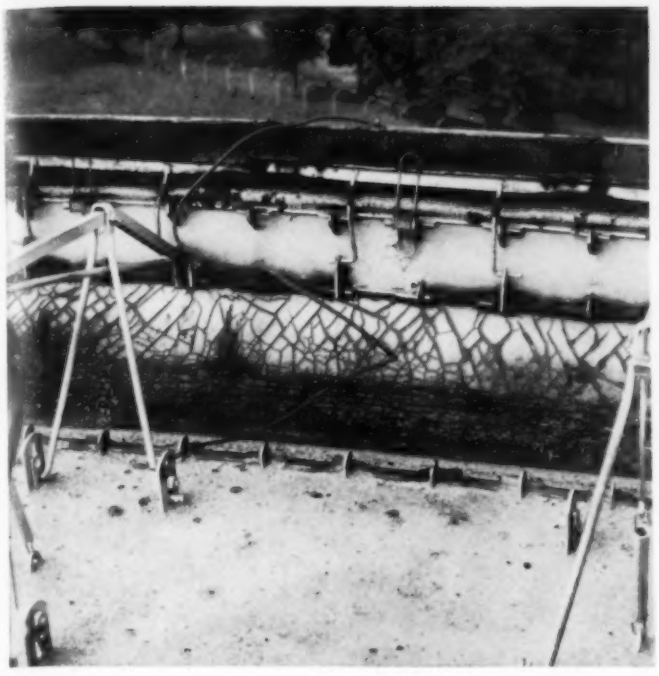


FIGURE 5—Heavy copper wire is fastened to the tank shell and floating roof to protect against the build-up of static electricity. Laboratory tests proved that the heat from friction and sparks was not dangerous. The big danger comes from static electricity.

FIGURE 6—Bottom of the ladder also must be bonded to the roof in order to complete the protective circuit.

FIGURE 7—Grounding the operator is just as important as grounding the equipment. Hose is conductive; bonding cable from nozzle is taped to the hose and the operator is holding the wire leading to his wrist band.

FIGURE 8—Sandblasting on the roof of a full tank! is non-hazardous if the precautions listed here are followed. Note the fire-fighting equipment poised and ready.

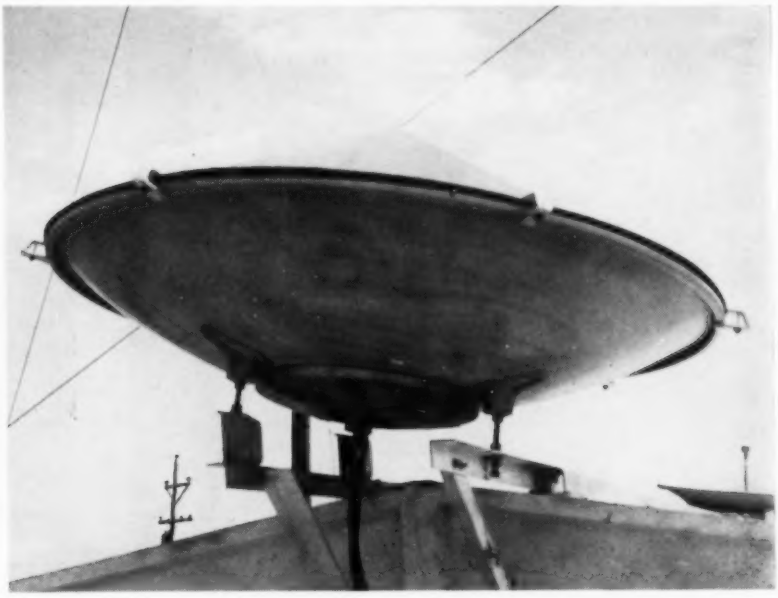
and hose must be of conductive type (Figure 3).

6. Generator, hose, nozzle and operator must be bonded and grounded to tank roof and shell.

FLOATING-ROOF TANKS

1. Floating roof tanks should be virtually full in order to provide better ventilation above the roof.
2. Floating roofs must be bonded and grounded at top and bottom of ladder and from roof to tank shell (Figure 4). Also, the generator, hose, nozzle and operator must be bonded into the same circuit with tank and roof.
3. All openings in sight-gage appurtenances, from which vapor may escape, must be sealed off.
4. All vents, gage hatches, etc. must be closed tightly.
5. Sandblasting must *not* be done on any floating roof of which seal is defective.
6. Adequate fire fighting equipment must be available on the roof, manned and ready for use.
7. Sandblast helmet and gloves should be worn by operator to prevent injury to eyes, face and hands.

The savings that can be safely realized through sandblasting tanks filled with oil are considerable. The tank need not be emptied and freed of vapor. Summed up this can mean a sizable reduction in maintenance costs. —**The End**



Best Idea for overcoming icing problems and spider web build up on antennas was the company-designed antenna cover—or paradome—made of fiber glass and plastic. It causes little loss of signal. Note rubber gasket which provides a seal between antenna and dome. Installation (left) is at Platte's Nashua Station. EXPENSIVE HEATER on underside of antenna (right) is not used now. The heaters required excessive amounts of power; one shown here is rated at 1,000 watts. Note that fiber glass paradome clamps over antenna.

MAINTENANCE TIPS

How Platte Whipped Its Double Tough Microwave Problems

The company has over 40 microwave stations. When one fades or goes off the air, the entire 1,023-mile system logs an outage. This tells how these outages were sharply reduced

James A. Brooks, Communications Supervisor
Platte Pipe Line Co., Kansas City, Mo.

MOST OF THE MICROWAVE SYSTEMS now in operation can be vastly improved if the operating company will adopt a continuing program of replacing of modifying components of the system as technological developments occur. This, plus a well-organized maintenance program, spells *reliability.*

The term *reliability* as used when discussing communications systems may be broken down into two main categories: First, there is the more conventional meaning of reliability which refers to "equipment." This concerns the capacity of the equipment to provide service for extended periods of time with minimum attention. There are three minor categories involved in equipment reliability. They include *commercial and standby power, maintenance programs,* and *the quality of the equipment itself.*

Power outages. At the present time considerable outage results from primary power failures, but it is felt that this can be eliminated in due time by the use of better standby power facil-

ities. Power requirements may be something for the equipment manufacturer to consider seriously in designing new microwave repeater equipment. **Low input power requirements could lead to more economical, fast switching standby power sources, which would greatly improve this phase of equipment reliability.**

Propagation reliability. The second main category of reliability has to do with transmission. It involves the propagation characteristics, system engineering and the ability of the equipment to perform under adverse conditions. This is the category I wish to discuss as *propagation reliability*. It should be pointed out that this discussion is based largely on the experiences I have had as supervisor of the operation and maintenance of Platte Pipe Line Company's microwave system.

Platte's system extends from Wood River, Illinois, to Casper, Wyo., totaling 1,023 miles of microwave path. This includes some 40 microwave repeaters, 3 back-to-back terminals, and 2 end terminal stations. The average distance between stations is 23.75 miles. At 13 of the repeater stations, carrier drops are provided for pump stations. At two of the repeater stations, the trunk system is connected to spur microwave links, which provide connections to pump stations off the main-line communications system.

This microwave communications system supports 12 unattended and 3 semi-attended, remotely controlled pumping stations.

The system is multiplexed to 9 voice frequency channels on 6,700 mc. equipment. Full RF standby equipment is continuously energized and ready for immediate service from either local faulting or from remote selection.

TOWERS

The foundation for propagation reliability is the stability of the tower. The factors involving tower selection are many and varied. There is no doubt that currently designed microwave towers fulfill the necessary requirements; however, it has been found that some of the older tower designs do not fulfill the stability requirements.

Stability. Platte is currently engaged in a study of its middle-size tower, which is the most widely-used in the system. From this study we hope to determine maximum stability requirements without over stressing the towers, then proceed with necessary modifications.

Platte engineers found that the manufacturers' recommended guy tensions had to be exceeded by 200 percent in order to attain stability in high wind velocities. The study will soon be expanded to cover the other tower sizes in the system. Three basic tower sizes cover heights ranging from 60 to 300 feet.

Tower maintenance. Many theories have been advanced on the question of tower maintenance, but no set patterns have really been developed. In guyed tower maintenance, guy tensioning is an item of extreme importance. Excessive tensioning may exert additional compressive loading to the point that the tower may collapse. Insufficient tensioning may result in tower failure due to that type of metal fatigue experienced in an extremely limber structure. Guy tensions should be applied to the amount required for the required stability and no more.

Regular inspection and maintenance of towers plays a vital role in system reliability. Platte has not adopted a complete tower maintenance program, but an attempt is being made to establish the necessary procedures to provide the required tower stability and protection to the towers. A detailed tower inspection is conducted in conjunction with the painting program on a three-year basis. This inspection is performed by a tower maintenance company, which makes a thorough check of all hardware and guying. All guy tensions are checked with the use of dynamometers. These instruments are periodically checked by a local engineering laboratory.

Inspection climbs. Platte insists that the microwave technicians maintain a constant surveillance of the tower condition and that they make at least two inspection climbs each year. Frequent recording of path signal data will give early warnings of tower difficulties. Before any alignment of antenna and reflectors is attempted, the towers are checked for vertical plumb and correct guy tensions.

Corrosion of guy anchors has been generally ignored for many years, but Platte found dangerous cathodic potentials on more than half of their towers. Considerable pitting was found on the guy anchors, and rectifiers have been installed to provide protection. In many cases, the anchors should be dug up, inspected, cleaned, and coated with a satisfactory protective compound.

A well-planned maintenance program for towers is doubly advantageous. A company will profit not only from the standpoint of propagation reliability but will be provided a much safer structure. The tower is one item of equipment that can be expected to provide an indefinite period of service if it is well maintained.

ANTENNAS, HEATERS, AND ANTENNA COVERS

During the first two years of operation, Platte experienced a number of outages due to icing of antennas.

Some of the Ideas that Paid Off for Platte

Towers:

Guy tensions 200 percent over manufacturers' recommendations to withstand winds. Technicians required to make two inspection climbs per year. (Resulted in discovery that spiders were causing propagation trouble.)

Antenna Icing:

Heaters were too expensive to operate; canvas covers gave too much trouble. But company-design fiberglass and plastic paradomes are paying off. (Prevent spiderweb build up, too.)

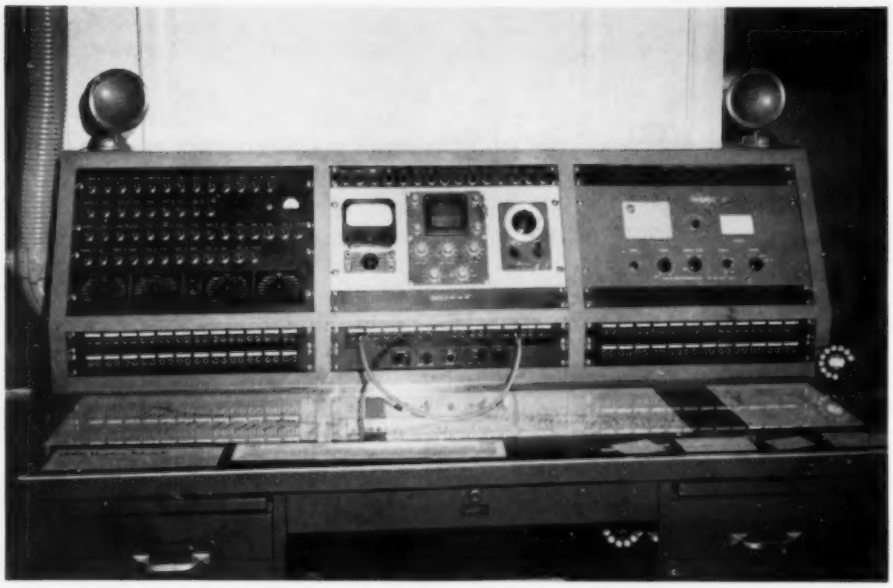
Signal fading:

Proper size reflectors solved majority of fading problems.

Path Alignment:

Alignment should be carried to the point that calculated signal strength is attained. This signal strength should be recorded for future reference.

A company-made alignment kit speeds this job.



SYSTEM CHECKS are made with this microwave system maintenance console. Also individual carrier checks can be made on the console's self-contained jack panels and other testing equipment. A fault panel and facilities for remote switching are also provided on the console. This unit is fitted for control of Platte's VHF system which is integrated with the microwave system.

Ice accumulated on the antenna feedhorns, and snow piled up in the parabolic reflectors. Feedhorn and 1,000-watt dish heaters with outside thermostats were originally supplied to cope with this problem. In the winter months under thermostat control, the heaters were on most of the time. The power bills were so large that the heaters were left off most of the time. It is rather amusing as we look back upon it, but Platte's technicians actually drove ahead of approaching snowstorms turning the heaters on. At times they failed to reach the stations before unannounced storms left us with a broken system or, at best, a noisy one. The heaters we did manage to turn on would then use power until the men were able to return to the station and turn them off.

At the time radomes for covering the antennas were available, but the costs were prohibitive.

Humidity detectors. Our next approach to the problem was to connect the thermostat in series with a humidity detector. This would energize the heaters when moisture and freezing temperatures existed simultaneously. With this theory in mind, Platte worked with several different devices but gave them up as either too expensive or too complicated. While seeking out the proper controls, the enormous amount of maintenance required for checking and caring for two hundred heaters was not ignored. It was clearly evident that there had to be an easier solution.

Black canvas covers. During the month of December, 1955, Platte had a local awning company fabricate two canvas covers. They were made of inexpensive, waterproof, dark-colored awning materials. By using this type of cover, the wind and the sun's rays were utilized to break up the formation of ice. Tests indicated that microwave power loss due to the covers was very small. The covers proved to be so successful that we abandoned all heaters and outfitted the entire system during 1956. The usual procedure, using these covers, was to remove them during the summer months and make necessary repairs at that time.

Disadvantages. The canvas covers provided ice and snow protection, but they still left much to be desired. One-man installation of these covers is a rather difficult task, and a lot of time was devoted to installation and removal. We were also confronted with shrinkage of the covers. The shrinkage could actually re-position the feedhorn and reduce the signal strength between stations. Care had to be taken to make sure they were not too loose. If they were, the wind beating against the cover would actually shake the feedhorn. This caused circuit interruptions and in three instances the feedhorn was broken off.

Spiders can cause outages. The winter season is not the only time that conditions around the antenna lead to outages. For the past couple of years we have had trouble with spiders at numerous stations in Missouri. This condition may have existed for a longer time, but spiders were not identified as the cause of our troubles. The spiders lie directly in the iris of the feedhorn, and during periods of high humidity they can severely attenuate the entire signal. At other times they can provide such a mismatch to the klystron that the system is virtually unusable, this being particularly true on equipment not using klystron load isolators.

Plastic bags. Our immediate solution to this problem was to tape plastic bags, of the type used in storage of frozen foods, securely over the feedhorn. This is a recurring chore and requires constant surveillance, because life of the bags is short due to wind and weather. We also encountered heavy condensation of moisture within these bags on several occasions. Condensed water droplets on the inside of the bag produced a severe impedance mismatch.

Noise in the early morning. One interesting problem associated with the plastic bags developed suddenly on a specific section of the microwave system. During the early morning hours, we experienced noise and distortion in a six-station area. This continued for several days before we came upon the answer. The only change that had recently taken place was that painters had sprayed the buildings and dishes. They had been cautioned about the feedhorn and it appeared they were careful enough. However, a very fine spray not easily detected had fallen upon the plastic bags. In the early morning, a heavy concentration of water droplets collected on the paint that had drifted on the plastic bags surrounding the feedhorn. The attenuation was great enough to drop the circuit completely out.

Solution. It was evident that the only complete solution to the antenna problem was to install a permanent

sealed enclosure over the feedhorn and dish. We solicited the aid of one of our local equipment representatives who, in turn, arranged for a local manufacturing concern to produce four prototype covers at a price that could be easily justified. The covers were built of ordinary fiberglass material which provides excellent rigidity and a long service life. The loss at 6,700 mc. is between ½ and 1 db. The actual installation of these permanent covers requires little if any more effort than the canvas covers. When the covers are installed the enclosure is not airtight but tight enough to prevent spiders from entering. By the end of 1960, over half of Platte's antennas will be covered with fiberglass paradomes.

REFLECTORS AND SIGNAL FADING

During the first couple of years that Platte's system was in operation, signal fading was not a prime element of concern. In fact, there were times when outages couldn't be positively identified as being caused by fades. Once the electronic equipment was operating properly, fades became an item of concern.

One of the most troublesome and frustrating types of fade is the multi-path fade. Our microwave system extends for many miles over the plains of central Nebraska and, although the terrain is deeply cut by erosion, we had severe multi-path fades in that area. According to the theories then accepted regarding multi-path fades, we shouldn't have had as many as we did so we kept looking for another cause of trouble. We found it.

Four-foot Gabriel parabolic antenna

Multiplex Equipment Racks in the Kansas City center. Author James A. Brooks inserts a tube in the matching distribution panel. Also shown is the VHF keyer and coder as well as the telephone carriers.

Reflector sizes. When our system was originally designed in 1950 and 1951, very little was known about the general theory of antenna and reflector sizing versus tower heights. W. C. Jakes of Bell Telephone Laboratories investigated this matter in 1952 and 1953 and wrote some interesting and conclusive articles, complete with theory and curves. After we discovered just how much signal we were losing by using six-foot parabolas and six-foot reflectors on 240-foot towers, we began to wonder if some of our trouble could be eliminate by changing to large reflectors. We changed one path, signals came up to the calculated value, and the fades disappeared. Since that time we have changed reflectors on many paths and every time our fading troubles have vanished. The signal gain alone did not remedy the fades, but we observed that the radiation pattern of the antennas was smoother and more uniform. Alignment of the six-foot combination was difficult. The new combination is easy to align.

Fading caused by upward bending and simple attenuation. These types of fading are always accompanied by severe weather fronts. When the severe weather front becomes stationary, the fade persists for several minutes and sometimes hours. The only cure for this type of fade is more signal, but we feel that since they are so rare and the signals would have to be so much stronger we cannot justify the means to correct them.

PATH ALIGNMENT

Proper alignment and polarization of the antennas and the reflectors on both ends of a microwave path is extremely important. In order to perform this highly important task of

alignment it is imperative that proper techniques and equipments be used.

When the alignment crew moves into a station, they should know exactly how much net signal the path will provide. The net signal strength can be accurately calculated. Prior knowledge of the calculated net signal strength will provide a goal to be attained. *If the crew adjusts the antenna and reflector to an optimum or peak reading without reaching the goal, their effort has been wasted. If the calculated net signal is not received, trouble exists and it has to be found.* It is relatively easy, even for an experienced crew, to peak up a path short of the calculated signal and be tempted to ignore or minimize the importance of finding out where the signal is being lost.

Experience with this very thing has convinced us at Platte that if a rigorous alignment will not yield the calculated signal, we should and do keep looking. We have never failed to align a path to calculated values, although there have been numerous moments of doubt.

After the Platte system was in operation for a year or so and re-alignment of antennas and reflectors became necessary, it was evident that the practice of yelling and peaking would not suffice. By the time that a peak signal was observed at the microwave equipment and the man at the reflector could be told to stop, the peak signal was passed. The process would have to be repeated and most of the time the peaking was concluded with a signal less than optimum.

An alignment kit was devised to eliminate the confusion and yelling. A cable of sufficient length for the tallest tower was fitted with connectors on each end and coiled on a portable reel. A small box containing a signal strength meter and jacks for sound-powered phones is plugged into the cable and carried to the top of the tower for reflector alignment. The other end is connected to the microwave equipment and thus provides the alignment crew with a remote meter for precise alignment. The telephone communication link is provided between the men on the ground and the men on the tower for any necessary conversation.

This same unit is used for parabolic antenna alignment. By providing a remote signal meter to the man adjusting the reflector, a precise adjustment can be made in a very short period of time. The communication link is used to advise all parties of the proper signal is attained or if a shortage still exists. This will virtually eliminate all possibility of aligning on minor lobes.

Making records. When the path is properly aligned, the signal should be recorded to provide the area technician with the information he will need to detect a gradual or abrupt deterioration of path signal. The technician should continuously observe the signal level, and when he notices a change he should immediately report it so a prompt investigation can be started. Polarization alignment, of course, goes hand in hand with vertical and horizontal alignment, and it should be checked whenever a major re-alignment is performed.

PROPAGATION MAINTENANCE

It is a natural reaction for persons in microwave system maintenance to think of reliability of systems in terms of the electronic equipment performance. Of course, the performance of the equipment is important but propagation is equally important.

A microwave system is no better than the worst hop; the over-all reliability of a system is no better than the propagation reliability of one path. Although it is difficult to instill this idea in the mind of a technician who spends most of his time maintaining tube-using equipment, he must keep one eye on propagation.

Although a deterioration of less than three decibels on a path with more than thirty decibels margin would seem relatively unimportant, reference to the field strength pattern of a typical antenna will readily show that the radiation lobe could have moved a large fraction of a degree. If the shift would continue or if a high wind would move the reflector even slightly, the signal strength will be greatly affected. If the system maintenance technicians are acutely aware of this situation, and conscientiously measure signal levels with this in mind, the over-all propagation reliability of the entire system will be enhanced. —**The End.**

About the Author

James A. Brooks is communications supervisor for Platte Pipe Line Company. He joined Platte in 1952, and has literally grown up with Platte's communications system from the time of its initial installation. Prior to joining Platte, he worked as a broadcast engineer. From this job he was recalled to active duty in the Air Force and served in Korea as an operations officer of an AACS Squadron. After spending five years in the Air Force on his original tour of duty during World War II as a communications officer, Brooks was graduated from Central Radio and Television School of Kansas City.

Called upon for an impromptu speech would you "er" and "ah" and thoroughly embarrass yourself and your audience? Here's a formula that will help you out in such a situation, plus tips on introducing and "thanking" a speaker

Three Hard Speeches to Make

By George McWilliam
British Columbia Railway Electric Co., Ltd., Victoria, B. C.

THERE'S LITTLE doubt that one of the hardest speeches to make is the impromptu speech where you have very little or no time to prepare exactly what you want to say. Two other kinds of talks which can give you some difficulty unless handled just right are the one you give to introduce another speaker and your comments following his address. However, there are certain rules you can follow which will make all three much easier for you. But let's take them one at a time!

THE IMPROMPTU SPEECH

An impromptu talk is a speech that you may be called upon to deliver entirely without notice to an expectant audience. To the novice this could be a terrifying experience and this type of situation probably more than any other, has persuaded people to study public speaking. The favorite theme in some magazine advertisements for teaching public speaking by correspondence has been, "The president asked me to speak at the sales convention and three months later I was sales manager." However, joking aside, a well made, thoughtful impromptu talk has undoubtedly been the turning point in many careers.

At the outset, let us say there is nothing to be afraid of. We will take for granted that you know the subject of your speech. You know something of it or otherwise you would not have been asked to speak in the first place. However, you have been asked—now, how are you going to do it?

Your Big Chance. The big secret of this type of speech is simple organization. Whoever has asked you to speak knows you have some particular knowledge of the subject. Another point in your favor is that your audience knows you are on the spot and is sympathetic. The most important thing now is what impression are you going to give them as you rise to your feet. Are you going to, "er" and "ah"? Will you apologize—say that on this short notice—stall and confound the friendly confidence of your audience at the outset? If you are, opportunity has pounded on your front door and pitched a tent, but your answer has been a rebuff. No you can't do that!

You should smilingly address the chair, and your audience quietly. Pause to allow your audience to relax, then start off with a standard introduction. You must give an impression of poise, sincerity, and possibly specialized information.

Now, as to the technique peculiar to the impromptu speech. The average audience believes it to be difficult but with your knowledge of public speaking you know it isn't.

Use This Formula. The easy formula that has been a key factor in

the speeches of nine-tenths of the impromptu speeches ever made, is contained in the following seven words:

1. What
2. Where
3. How
4. Why
5. When
6. Who
7. Which

Your thoughts and knowledge can be compared to a flowing stream containing thousands of units of useful but unharnessed energy. These words can be compared with power stations that transform your knowledge into power to perform useful work and provoke action.

They are questions you ask yourself about the subject although not necessarily in the order named.

For instance if the subject was unemployment:

HOW has employment been handled in this country?

WHAT governments have handled it?

WHAT has it cost?

WHERE has unemployment been concentrated?

WHERE has trouble developed?

WHY has trouble developed?

WHO have been unemployed—young or old—male or female?

WHEN did it start?

WHEN will it end?

HOW can it be ended in your opinion?

WHICH is the best method of handling it?

Study Others. You can see from the formula using those seven words that it is very easy to develop a talk on very short notice. You will find in your impromptu speeches, you will benefit from carefully studying other speakers. Little tricks that they have used, and that you have unconsciously observed, will come to mind and assist you in the construction of the speech.

Some speakers frequently called on for impromptu speeches have a store of anecdotes or quotations suitable for almost all occasions: "Ladies and gentlemen the prime consideration at this moment is brevity—my remarks therefore will be like a modern feminine costume—long enough to cover and short enough to be interesting." However, while such tricks are not essential, they have their value.

The essentials are contained in the formula given above. Do not drag-out your speech. Have thought provoking introduction and directly you have said what you have to say put a punch into your conclusion and sit down.

It is well to remember that an impromptu speech is an opportunity. Accept it. Take it seriously. It's quite simple.

THE SPEECH OF INTRODUCTION

In introducing a speaker yours is a two-fold task. First, you must make your speaker, your guest of honor, feel at home. Secondly, you must introduce him, efficiently and graciously, to your meeting.

In making this introduction your prime consideration is brevity. The situation, embarrassing and annoying to both speaker and audience wherein the chairman makes an address of some length introducing a speaker, is a landmark of humor. However, it definitely is not humorous. I can recall several cases where a chairman has taken over thirty minutes to introduce a speaker.

Rule One—Be Brief. In preparing a speech of introduction, and a speech of introduction must be prepared just as any other speech, there are two angles to consider:

1. The material for your speech.
2. Your manner of delivery.

Let's take these one at a time. The material for your speech of introduction should include:

1. What is the subject?
2. Why is the subject?
3. Who is the speaker (not necessarily his name, but what he is)?
4. Why is he the speaker?
5. Appreciation of courtesy of the speaker.
6. Welcome and formal introduction.

The above could be a formula for a "safe" introduction—brief, thoughtful and gracious. Here's how it works in actual practice.

Your job is to secure the attention of the audience for your guest and naturally you have prepared for the task. You possibly have telephoned his secretary for certain information asking her if there is any particular angle that should be stressed. You may have contacted him directly. If he is a well known person, you have possibly contacted the better known sources such as your public library.

One Example. Let us use the formula and develop a short introduction:

1. **What is the subject.** "Today we are to be favored with an address on unemployment."

2. **Why the subject?** This is without doubt one of the outstanding problems of our country. You will hear it discussed North and South and East and West—in high places and in low. It is the subject of gossip and deep concern. We all have our pet solutions for the problem. You all have come in personal contact with it and it must affect directly and indirectly the livelihood and future of every one of you."

3. **Who is the speaker?** "If anyone can be called an expert and authority on unemployment, our guest today must certainly be placed in that category. For years Secretary of Labor, he has come in contact with almost every phase of the problem. Since his college days when he worked his way through Yale University, he has seen this problem grow in national significance."

4. **Why the speaker?** "His studies and experiments in the field of unemployment have been watched with close interest across the entire United States."

5. **Appreciation.** I know that his courtesy in honoring our table today is appreciated by you all.

6. (Formal Introduction) "Gentlemen—the Honorable....., secretary of labor, who will address you on the subject of unemployment—Mr.....

The above is only one application of the formula. There are many, many varieties of application.

Be Careful. One warning, in preparing your material, be sure that it is accurate. If you are not sure of its accuracy, throw it out. Never take a chance if you want to avoid embarrassing yourself and your meeting.

One more warning—this may seem absurd to you, but be sure to get the name of the speaker correctly, and its correct pronunciation. This situation is not so extreme as you may surmise—it does develop quite occasionally and because of the regularity of its development it also is firmly ensconced in the field of humor. You have probably heard before of the chairman heaping praise on praise—"he needs no introduction, Mr. er . . ah . . . er." Therefore:

Print his name somewhere where you can see it plainly from your standing position when making the introduction.

The speech of introduction is a prepared speech. The ordinary rules of speech construction apply. The speech has an introduction, body and ending. As you grow in experience you will introduce your speech of introduction with an anecdote or a humorous note. You will refer to previous associations with the speaker and so on. However, until you have more experience play it safe. Stick to the formula. Your job is not to impress your audience with your wit—it is to introduce the speaker.

What Manner? As far as manner is concerned this is most important. A chairman, ill at ease (possibly because he has not prepared his introduction) will make his audience restless and will handicap the speaker before he commences. Relax—smile. Genial and urbane is the ideal chairman. Your speech of introduction is not a declamation but delivered if possible in the conversational style.

Your job once again is to create a receptive atmosphere and make your guest feel at home.

An important part of your speech is the indication or the cue you give your guest that he now has the floor. Just before finally using his name, turn to the guest speaker and with a slight bow and possibly a gesture—invite him to his feet.

Remain standing until your guest commences to rise.

THE "THANK YOU" SPEECH

Over a period of time you have all heard speeches of "Thank You." You will all agree that a brief, gracious speech of "Thank You" can add considerable to your program.

Let's briefly delve into the mechanics of it.

Unless this is a response to a toast, this is always an impromptu speech and you have rules for impromptu speeches in this article. One thing that must be remembered is that you are responding on behalf of the meeting and you should indicate this in your remarks quite plainly. Often the speaker is addressed direct.

Please Be Brief. All that is really required is tact and courtesy. Brevity again is the first criterion. I am often reminded of the old saying "Take the bull by the horns." In the case of thanking a speaker I suggest you take "the bull by the tail." You can let go just that much sooner.

If there is such a thing as a formula for a speech of Thank You it most certainly should include the following:

1. A reference to the chairman's introduction.

2. A reference to a highlight of the speech.

3. Thanks for his courtesy in attending.

4. If he calls for action assure him that his representations will receive consideration.

Here is a sample of a short "Thank You Speech."

"Mr. Chairman, Mr....., Gentlemen. It has fallen to my privilege to express on your behalf, our sincere appreciation of Mr.....'s address. We have keenly anticipated this talk because there is not one of us that is not familiar in some way with the very fine work in the field of unemployment research of our honored guest. In his address today he has opened new vistas of thought for us.

"His figures on the problem have astounded all of us, and I know that I can assure him on your behalf that his suggestions will receive serious and immediate attention.

"Mr....., the applause of this meeting has indicated to you in a small measure our appreciation of your most thoughtful address and too—of your courtesy in visiting us. It is all too seldom we have the opportunity of listening to so thoroughly informative an address.

"Thank you, Sir, and may we extend to you our best wishes for your continued success in your work on this problem—Unemployment."

Keep It Simple. Once again—you are still a novice. You are not unique in this category as 75 percent of our speakers are in that same classification. However, your audience need not know this and they won't know it as long as you do not attempt to over-elaborate your speech. Make it *simple, brief* and *courteous.*

A simple, brief speech will be appreciated by the speaker and will adequately express the thanks of the other listeners to the address.

Alternatively, an over-elaborate speech will stamp you for what you are and will be the reverse of your object—to thank the speaker for his address.

There are probably very few better ways of developing executive qualities in employes than through public speaking. Although all can't be leaders, public speaking aids in developing confidence and poise which sometimes is so necessary for promotion.

About the Author

George McWilliam attended the University of British Columbia. He later studied engine mechanics, and taught an Aero-Engine Course for the Royal Canadian Air Force, for which he also wrote a syllabus. He then joined British Columbia Electric Co. and was appointed personnel assistant. In this capacity he handled employment, interviewing, employe counselling, administration of psychological tests and their interpretation, employe training, and organization of technical and clerical courses. He has taught and organized courses in public speaking and first aid. For the past eight years, McWilliams has been in charge of industrial safety for B.C. Electric.

Pipe Line Pete's

IDEAS FOR THE FUTURE!

. . . in pipe line engineering, construction and operations

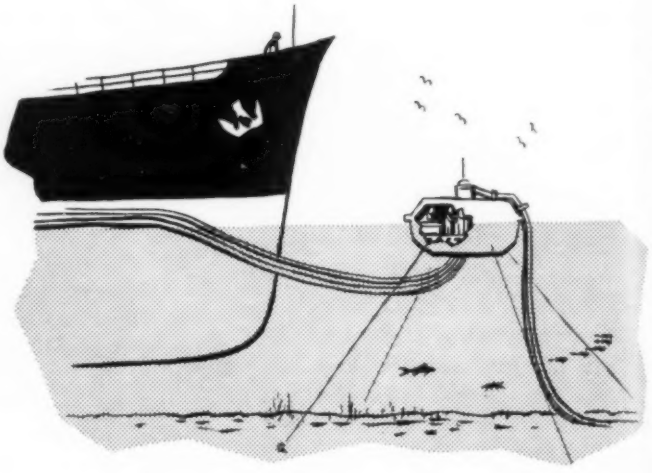
By Donald M. Taylor, Engineering Editor

Floating Station Will Load Tankers at Sea

A sea-going filling station will go in operation late next month some six miles off the coast of Italy. The installation will be capable of handling oil tankers up to 100,000 tons which deliver crude to the SAROM Refinery in the Port of Ravenna.

The station in reality is cylindrical buoy. It can withstand a 4-knot current and winds up to 80 knots. One of its chief advantages is that it permits ships to swing on a 360 degree arc while loading.

The cost of this installation, which was designed and fabricated by AB International Marine and Oil Development Corp, a Swedish corporation, runs only a fraction of the cost of normal shore installations. What's more, it requires no dredging and little maintenance other than cathodic protection on the pipe line laid from shore.



New Coating Materials Hold Promise

A water-based latex of polyvinylidene chloride which will be produced at the rate of 14 million pounds per year starting this fall, may have a startling effect on the coating industry. Compared with polyethylene, the material offers three times the resistance to passage of water vapor, 1,000 times the resistance to passage of gas, great resistance to acids, solvents and alkalis. Its strength and fire retardancy are superior to polyethylene.

Initially, the spray-on coating will sell for 45¢ per pound of dry solids according to National Starch and Chemical. Polyvinylidene chloride sheets have been on the market for some time as Dow's Saran Wrap.

Fuel Carrying Tires Now Used by U.S. Army

A fleet of tanks shaped like tires—or tires that serve as tanks—are being used by the U. S. Army in Europe and the Pacific. The tire-tanks are fat—almost as wide as they are high—and they hold 500 gallons of fuel each. Their large area gives them a low ground-bearing pressure. The tires roll behind vehicles on the road or off the road and because the fuel is lighter than water, they float when pulled through the water.

This should have an excellent application for pipe line contractors.

Oxygen-Hydrogen Generator Reduces Welding Costs

An oxygen-hydrogen generator will reduce the cost of shop welding and cutting according to Battelle Memorial Institute. The same electrolytic generator will reduce the cost of making large industrial forgings, according to June 13th issue of *Chemical & Engineering News*.

The generator produces both hydrogen and oxygen in a stoichiometric mixture from water. When burned the gases produce temperatures in the range of 3,600° F which is sufficient to weld and cut steels, aluminum and other metals. A portable one-cubic foot generator can turn out all the gas needed by an average neighborhood welding shop. The cost is far less than conventional gas equipment.

The generator contains several nickel-plated steel electrodes about 0.06 inches apart in a plastic or insulated metal container holding a weak caustic solution. Current is run to the two outside electrodes, and the container is shut in so it will pressure up as current generates the mixture which is in ideal proportions for either explosion or burning. Cost of the gas will run 10 to 30¢ per 100 cubic feet.

A New Floating Hose; Underwater Storage Tanks in Gulf

A 500-foot continuous length of 4-inch floating hose will be used to tranship products to storage tanks in the Philippines from an inter-island tanker. The new hose, manufactured by Goodyear International Corp., will handle high pressures and it is resistant to most chemicals and fuels.

Underwater Storage Tanks

An underwater storage terminal in the Eugene Island area off the Louisiana coast should soon go in operation. The terminal is in 30 feet of water and the platforms for the men, helicopters etc. are 45 feet above the water. The tanks are large diameter cylinders laying horizontally on the Gulf floor. They will support the platforms above them. One of the novel features of the terminal are the scouring skirts around the terminal which will prevent the soft mud bottom from washing away.

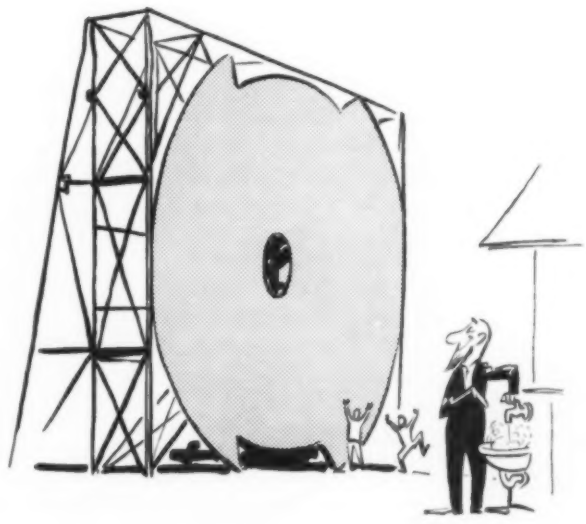
These units are being constructed by Higgins, Inc., for Ocean Drilling and Exploration Co. of New Orleans.

French Scientists Advance Solar Power Applications

In the Pyrenees, French scientists working with the world's largest solar mirror have devised a means of storing solar energy in an accumulator. Although this is a small part of the energy, it can mean an abundant supplement to heating energy in the distant future.

They have made commercial applications, too. In the large Wilson Hotel in Perpignan, they are providing 80 percent of all the hot water needed for radiators, water taps, cooking and other purposes.

At the present time they are constructing a second solar furnace 10 miles away at Odeillo, which will be used to produce 500-metric tons of refractory products per year "at half the price of equal quality products produced in steel plants."—From "France Actrelle."



More Developments to bring Better Products

Exploring the Sea

We already know more about the space around our planet than we do about the sea spaces which surround our continents. With this in mind, the Instrument Society of America is concentrating on this phase of instrumentation at its meeting in New York City September 27-29th. The society is presenting some 25 papers on underwater instrumentation.

Concrete Sans Water

A binding agent can be mixed with dry sands of the desert to make a concrete superior to the usual product made with water-cement-aggregate mixture. The process which was patented by the Prochimco Company will allow sidewalks, foundations, building blocks, flooring etc. to be made without any water whatsoever.

Superior Cement?

A new cement made of bauxite and limestone in a 1:1 mixture reaches almost twice the compressive strength of Portland cement. Chemically, the new cement consists mainly of calcium aluminates with very little of the undesirable silicates. The material is suitable for production of refractory bricks—at 1100 F the hydraulic bond is replaced by a ceramic bond. The material is also suitable for low temperatures.

Oil From Shale Closer?

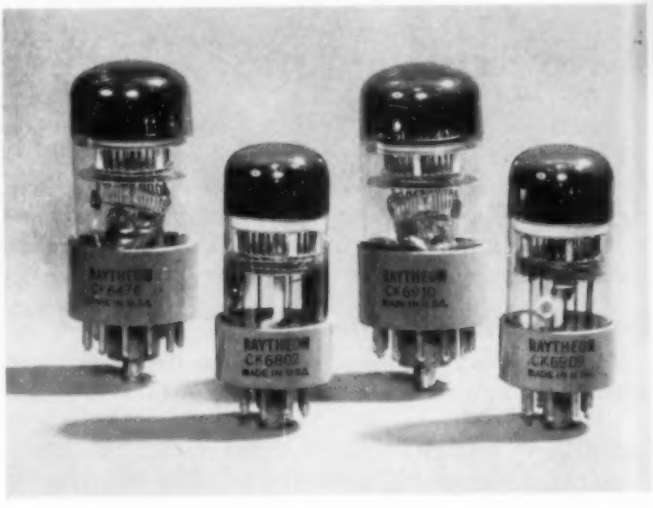
At Rifle, Colo., The U. S. Atomic Energy Commission fired a 1,000-pound charge of chemical explosive in a 115-foot shaft drilled in the floor of U. S. Bureau of Mines' experimental oil shale mine. The purpose was to gather data from which to predict the effect of a nuclear blast in oil shale. A second explosion is scheduled soon.

Electron Tubes Count Up to 100,000 Units Per Second

Electron tubes that can count pulsations up to 100,000 per second and visually display the totals on their faces were introduced by Raytheon Company at an instrument show last month. Called *decade counter*, the tubes record and indicate the count on 10 glowing cathodes in luminescent dials within the tubes. With numbered face-plates placed on series-connected decade counters, the total can be read visually in units, tens, hundreds, etc. during operation.

One of the chief uses predicted by the maker will be in pipe line measurements.

The tubes are a cold cathode, bidirectional, ring-stepping device featuring low dissipation and short resolution time.



Advancements in Industry Research Continue

Vacuum Lessens Friction

Linear motion between two dry, clean, unlubricated flat surfaces produced abnormally low friction values in a high vacuum. The microscopic nature of the actual surface-to-surface contacts was studied by Litton Industries of California for Air Research and Development Command. Under certain conditions, models loaded to yield pressures, could be made to slide with abnormally low friction forces without microscopic evidence of wear or surface distortion. For more information write U.S. Department of Commerce, Washington 25, D. C.

Metal-fueled Fuel Cell

The Exide division of Electric Storage Battery Co. has developed the first metal-fueled fuel cell. The company hopes the new device will lead to electric-powered materials handling equipment. Here's how the metal-fueled cell works: Zinc powder combined with a catalyst is pressed into thin-walled tubes, supported by tubular forms of perforated PVC and woven fiber glass arranged in a circle around a central positive electrode. Oxygen fed into the electrolyte oxidizes the zinc to produce current generating reaction. The unit can be re-charged by reversing the current.

Peru Offshore Well

A site one mile off the coast of Peru has been selected as the site of the first underwater oil well completion. The flow lines will be aluminum welded together and floated into place and submerged according to early plans.

Monitor all variables with one low-cost system

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omniguard system cuts operating and maintenance costs—

helps you make maximum use of manpower

Whatever your type of operation, manual, remote or automatic, you can reduce personnel, operating and maintenance costs with a low-cost Thomas A. Edison Omniguard monitoring system.

Virtually all critical temperatures and pressures can be guarded with this one system: motor and pump bearing temperatures, pump case temperatures, station suction and discharge pressures, unit suction and discharge temperatures and pressures, motor winding temperatures, and in compressor stations compressor cylinder temperatures, cooling water temperatures and lube oil temperatures and pressures.

In addition to guarding against equipment failure, Omniguard assures optimum use of your equipment. Due to its accurate monitoring you can operate your equipment at maximum load with complete safety. You'll be able to handle greater capacities with less equipment. Fuel and maintenance costs will be cut.

You'll require fewer personnel for monitoring because Omniguard does an accurate job of watching critical pressures and temperatures.

In automatic operation, Omniguard is readily adapted to computer operation and permits easy transmission of digital data. The reliable performance of Omniguard makes it ideally suited for completely automatic stations. Each temperature and pressure is monitored continuously by means of individual wheatstone bridge circuits. There is no scanning—no mechanical or electronic stepping switches to wear out or require maintenance.

For complete information see your Edison Representative or write for Catalog 3036C.

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To be dubbed "live wire" by customers is nice. But it also is a warning signal which alerts our organization to stay alive to the fact that a greater output of creative energy is necessary when you're in front running position.

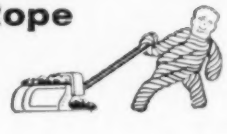
In the Union research laboratory and in those of the steel producing organization in which Union is integrated, technicians are hard at work on many new projects. They were started and will be finalized in the field where Union engineers spend more time than in the laboratory.

Classic example of what results from such deep and constant probing is the Tuffy family of wire ropes and slings, each one of them engineered to a specific job. Among 1600 standard wire rope constructions, in day to day production, none could be classified as the ultimate low cost wire rope for bulldozers, draglines, scrapers or hoisting equipment. One by one new metallurgical specifications and rope and sling constructions were tailored to meet the different but tough operating conditions inherent in the jobs these machines perform.

Tens of thousands of applications have established the unchallenged supremacy of Tuffy special purpose wire ropes and slings.

Tuffy Wire Ropes and Slings are "Job Prescribed" for Tough Jobs

Tuffy Balanced Dragline Rope



Tuffy Balanced Scraper Rope

Tuffy Balanced Dozer Rope

At Mount Rushmore National Memorial in South Dakota small fissures in the sculptured faces of Washington, Jefferson, Lincoln and Roosevelt are being sealed with granite dust and white lead. Though the granite sculpture is estimated to last for thousands of years, this preventive maintenance will keep the surfaces smooth and slow the natural erosion process. The insert shows how workmen are suspended on Union Wire Rope.

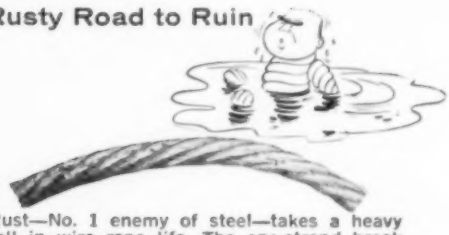
For "Live Wire" Service— Look Up Your Union Distributor in the Yellow Pages

When you get him on the wire, you're sure to get the best in wire rope and slings—plus service that helps you get from Union Wire Rope products all the quality and long life Union builds into them. Union Wire Rope Corporation, 2278 Manchester Avenue, Kansas City 26, Missouri.

Tuffy® Wire Rope Tips

Guard Against These Killers!...Get the Full Measure of Service-Life Built In By Wire Rope Specialists.

Rusty Road to Ruin

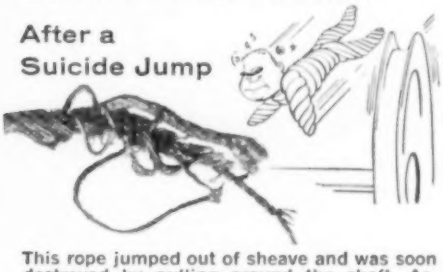


Rust—No. 1 enemy of steel—takes a heavy toll in wire rope life. The one-strand break shown here resulted when the rope was allowed to become rust-bound through lack of lubrication. Tests show that properly lubricated rope has up to 10 times the life expectancy of dry rope.

Crushed by a Tractor Cleat

The Sunday punch for this piece of wire rope was delivered by a tractor cleat—just one of many crushing injuries caused by rope being run over or banged into by hard, sharp objects. Even the toughest wire rope is no match for this kind of mistreatment.

After a Suicide Jump



This rope jumped out of sheave and was soon destroyed by pulling around the shaft. Actually it was a case of sudden slack which threw the rope out of the sheave.

Burned on a Frozen Sheave

End of the line came quickly for this rope as the result of operating over a sheave that did not turn. Note the exceptionally heavy abrasion on one side of the rope. Sheaves should be checked thoroughly and often.

Would you like a copy of a booklet in which more than a score of Tuffy Tips like those above are reproduced. If so, write Union Wire Rope Corporation, 2278 Manchester Ave., Kansas City 26, Missouri.

uffy Balanced lings and oist Lines

2-C

UNION Wire Rope

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How to do it

PIPE LINE HINTS

$10 is paid for each illustrated acceptable contribution. Mail to The Editor, PIPE LINE INDUSTRY, P. O. Box 2608, Houston 1, Texas

Use Welding Rod to Write Test Pressure on Vessel

Where separators or knock out pots are field fabricated, it may sometimes be wise to make a note of the pressure to which the vessel was tested. This will keep it from being connected into service which exceeds its design.

One way of noting this test pressure is to weld it right onto the vessel as shown. If the weld is carefully applied, it will not damage the vessel. But even if the weld were undercut, chances are, the damage would be less than that which comes when stencils are used to stamp it on the vessel.

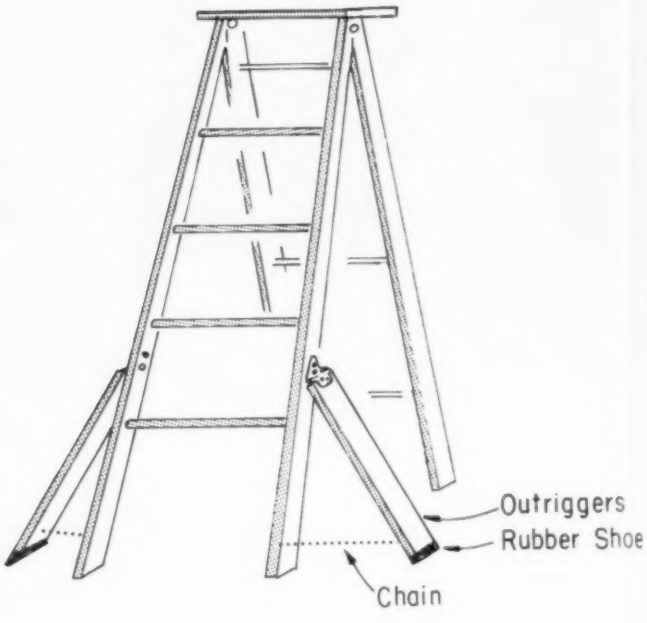
How to Haul a Heavy Load Of Pipe with Pick-up Truck

Basically, the trick is simple. Build a heavy-duty two-wheel pole trailer out of an old truck rear axle, let the pipe balance on it, and simply steady the pipe with the pickup truck as you pull it.

No great amount of weight is on the pickup truck this way.

Building the pole trailer is simple. Take an old truck chassis. Cut off the frame near the rear axle assembly, and add a length of three-inch pipe which serves as a tongue. Add a cross member which serves as a bolster.

Construct the rack which goes in the back of the pickup truck out of one-inch pipe. Primary purpose of the rack is to hold the pipe down and keep it from bouncing up and off the pole trailer. It can be constructed as shown.



Outriggers Prove Effective In Steadying a Step Ladder

Ask anyone to describe good safety practice in using a step ladder, and chances are he will say, "Have someone steady the ladder while someone is on it."

But here are outriggers which prove highly effective in steadying a ladder. If they are used correctly, they can eliminate the need for a second man to steady the ladder.

The outriggers are made of the same material as the runners of the ladder. They are attached to the ladder by hinges, cut slightly longer than the legs and rubber tipped to prevent slipping.

Swing Cover Over Drain Line To Protect Against Overflow

Place a swing cover over the station drain line—especially when it empties into a ditch that can overflow the station levee.

There are times when water can wreak havoc in an unattended station yard if it gets a foot or so deep. It can, for instance, float large empty tanks right off their foundations.

So if you have a sump pump, it might be advisable to add this feature to keep water from backing up into the station yard.

Sideboom Tractor Works From Semi-Trailer on Paved Roads

The sign "Tractors with Lugs Prohibited" did not stop this pipe line contractor. He simply ran the tractor up on a truck trailer and proceeded to lay pipe. When the residential section was passed and the mud took over, he rolled the tractor back down and continued through the fields to connect up a gas field to the gathering lines.

Temporary Radio Tower For Construction Headquarters

Here's the very simplest tower foundation. It is so cheap it can be abandoned when the pipe line construction spread moves on.

The foundation is Tee-shaped, made of 2-inch pipe and supported by three lengths of 2-inch pipe driven into the ground. Two lugs at the right serve as hinges when the bottom of the tower is bolted to them. After it swings erect, the lug on the running part of the Tee is bolted to the tower, and the guys are strung out and the tower is completed.

Portable Dog House Fits In Ordinary Pick-up Truck

Here is a compact model of a portable doghouse which can turn an ordinary pickup truck into a crew truck.

It is made of light gage steel and on either side there are padded benches. This makes this particular "doghouse" comfortable for four, crowded for six. Note the windows which are in the doors and on all four sides. Hooks and chains at the corners make it easy to boom down to the pickup. A lifting ring on top can be used if a sideboom happens to be near when the unit is loaded out.

WHAT'S HAPPENING IN PIPE LINE CONSTRUCTION

By Donald G. DePugh, Construction Editor

Photographs by Stow Manufacturing Co.

Portable Unit Preheats Pipe For Coating

Engineers Pipe Line Ltd. uses a portable space heater to preheat 4,000-foot section of 30-inch pipe in Indiana spread. The truck mounted 1 million Btu heater forces 7,000 cubic feet of air through the pipe keeping it warm enough for the coating to bond properly. The unit has an automatic electric ignition and an electrically driven fan and could be used for other purposes such as to warm workers, and thaw out machinery. It is equipped with thermostat to maintain constant temperature.

Construction Underway by Gaz de France on Test Pipe Line For Proposed Submarine Crossing of the Mediterranean Sea

While much speculation continues about the financial and engineering feasibility of a pipe line under the Mediterranean, a French company, Gaz de France, presently is constructing an actual test pipe line which is being laid in the Mediterranean.

The proposed gas line would carry gas from Hassi R'Mel in central Algeria, across the Mediterranean, through Spain and into Northern Europe—a distance of over 1,400 miles. The main line on land would be a large diameter of 24 inches or more; the crossing would consist of either several small lines or a single large diameter line. SOPEG is nearing completion on the gas line from Hassi R'Mel through Relizane and to Oran on the coast. From Oran to Cartagena, the Spanish port, the distance is about 71 miles and depths reach 10,000 feet.

Oceanographers and engineers have made studies to determine what the bottom of the sea is like. Famous frogman, Captain Jacques Cousteau, has been among the many who have explored much of the sea bed. Using radar, sonar, asdic and cameras, companies from the United States and Europe have studied the Mediterranean. Several methods of laying the pipe line under the large body of water have been projected. None to date has been tried. Films were taken at depths to 9,483 feet; photographs and surveys revealed that for about 1 mile off the coast of Cape Ivi, near Oran, the bottom is a mattress of compressed slime, ideal for laying an underwater line.

Undertaken by 30 specialists from Lacq and the Sahara, the test is being conducted at the foot of the Djebel Diss, where an immense shallow beach stretches out into the sea. Lorraine-Escaut and Vallouric, which carried out research and furnished 15,000 feet of pipe for the test, determined that a chrome, manganese, silicone steel was strong enough to resist extreme pressures and elastic enough to take considerable bending.

Another critical concern in constructing the test line was welding. Welders were carefully selected and tested; during construction each completed only three or four welds per day. Test pipe was preheated to 300° C; after welding the steel was annealed to 625° C using special ovens. All welding was radiographed by use of a cobalt bomb.

The test line was welded into 750-foot sections. These were assembled and joined by lock-bolts screwed on under 1,500 pounds pressure. Four 3,000-foot sections were then made up. These segments are being joined at sea by another bolting apparatus mounted on a specially stabilized vessel constructed at the naval base at Marsel-Kebir.

Testing. To test welds, they were coated with soap then submitted to 13 pounds internal air pressure. The sections then were hydrostatically tested to 1,323 pounds.

The pipe used is 8-inches in diameter, 0.5-inch thick, weighs 123 pounds a meter on land and 37 pounds a meter submerged. It is fed section by section from the beach onto a runway and towed out to sea by boat. It is first lowered to a depth of 45 feet, then to 1,500 feet. Attached buoys lighten it to 4.5 pounds per meter and cushion the pipe's descent. During the present stage, two joined sections are being held near the surface by buoys in order to facilitate the periodic checking.

A group of frogmen with sonar and asdic batteries follow the line as it is lowered meter by meter. Plans call for raising the experimental line in October at the end of the trials. If tests are successful, work will begin on the actual line across the Mediterranean. Completion time is estimated at about three years from starting date.

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CONSULTANTS
DESIGNERS

Compressor Station Built on Concrete Piles

Pacific Gas and Electric Company is constructing its McDonald Island compressor station on concrete piles for protection against flooding of the San Joaquin River. The compressor will serve the gas storage field northwest of Stockton. A 2,000 hp electric compressor, electric substation, scrubbers and dehydrators are being installed. The field will have a storage capacity of 30 billion cubic feet of gas and will go into operation in November.

Pacific Gas and Electric Receives Final Green Light on 1,400-Mile Gas Pipe Line

Pacific Gas and Electric Company is preparing to let contracts for construction of the 1,400-mile, $400 million gas line from Alberta, Can., to northern California. After receiving final regulatory clearance when California's Public Utilities Commission approved the project, Pacific Gas and Electric plans to get initial construction phases of right-of-way clearance and ditching started before winter season sets in. Construction will probably be delayed until next spring. Completion is scheduled for late 1961.

To transport the gas from Alberta, Can., Alberta Gas Trunk Line Company will lay 386 miles of 26-36-inch main line from Berland River area to the Alberta-British Columbia border. Alberta Natural Gas Company will construct a 100-mile, 36-inch line from that point to the British Columbia-Idaho border. From there Pacific Gas Transmission Company will build the 614-mile, 36-inch system to Malin, Ore. PG&E will continue the line from Malin to Antioch, Calif., laying 296 miles of 36-inch pipe.

The Canadian companies earlier received authorization to export the necessary gas to Pacific Gas Transmission and the latter company was granted FPC approval last month to build its system.

The major gas transmission line will cross the Canadian Rockies, the Cascade Mountains and 14 major rivers en route to Central California. Bechtel Corporation has already completed much of the preparatory work as the engineering consultant on the line. Contracts now will be awarded and work will begin on building access roads, clearing, grading and rock work on the right-of-way, establishing communications, delivery of the pipe and possibly digging the trench. Four compressor stations are planned for the line.

FPC Examiner Authorizes Transco Expansion Project

Transcontinental Gas Pipe Line Corporation's $52 million expansion program received an FPC examiner's approval. Subject to review by the full commission, the permit will allow Transco to lay about 280 miles of main line loops, a major portion would be 36-inch partial third line loops on the southern half of its system. Included in the project is the addition of 32,040 horsepower in 12 existing compressor stations, mainly on the northern portion of the system.

Transco also would construct about 10 miles of 8 and 10-inch line and four measuring stations to take gas from Block 76 and 86 fields, offshore Vermilion, La.

Peoples Files With FPC For New Expansion Project

The Peoples Light Gas and Coke Company subsidiaries, Natural Gas Pipeline Company and Peoples Gulf Coast Pipeline Company, has filed an application with the FPC seeking increased pipe line facilities.

Natural Gas Pipeline requests authority to lay 62 miles of pipe line and install various river crossings while Peoples Gulf Coast plans to supercharge 71 compressor engines and add 27 miles of line. Total cost of the project is estimated at $23.7 million.

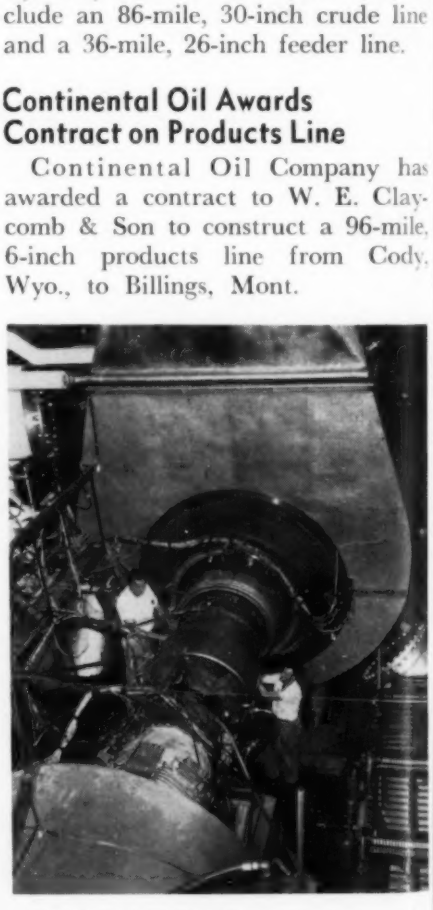
Bechtel Awarded Contract On Esso Libya Crude Line

Bechtel Corporation will construct the 100-mile, 30-inch crude pipe line for Esso Libya. The crude line, first to be built in Lybia, will extend from the Esso Zelten field to the Marsa el Brega on the Gulf of Sirte.

Another project is planned for Lybia by Oasis Oil Co. which will include an 86-mile, 30-inch crude line and a 36-mile, 26-inch feeder line.

Continental Oil Awards Contract on Products Line

Continental Oil Company has awarded a contract to W. E. Claycomb & Son to construct a 96-mile, 6-inch products line from Cody, Wyo., to Billings, Mont.



Jet Engine Turbine

Test probes are applied to J-57 jet engine as the jet-turbine is prepared for test run before being shipped to Columbia Gulf Transmission Company for installation at its Clementsville, Ky. station. The 10,500 hp unit will go on stream in November.

Great Northern Awards Contracts on Crude Line

Great Northern Railway has announced that a contract has been let on a portion of its 110-mile crude system to be built in North Dakota. Curran and Company will lay 50 miles of 6 and 10-inch line from Newburg, Wiley and Glenburn fields in Bottineau County, to storage and loading rack in yards of the railway company at Minot, N. D.

The line will be extended 64 miles northwest to the Lignite fields in Burke County, North Dakota, next year. Three pump stations will be constructed in the above mentioned fields.

Alberta Trunk Line Co. Lets Contracts to Banister

Alberta Gas Trunk Line Company has awarded contract to Banister Construction Company for the construction of 50 miles of lateral gas lines. The lines consist of 5 miles of 4-inch in Sedalia, 14 miles of 8-inch, 19 miles of 10-inch, 12 miles of 24-inch and 26-inch in the Cessford area. The project will cost about $2¼ million.

West Shore Pipe Line Co. Plans Wisconsin Pipe Line

Plans are being made by West Shore Pipe Line Company to lay a 250-mile, 10-16-inch products line from East Chicago, Ind., to Green Bay, Wis. The line would travel through East Plains, Ill., and Milwaukee to Green Bay.

Transco Lets Contract On Delaware Crossing

Fulghum Contracting Corporation has been awarded a contract to install a twin underwater crossing of the Delaware River between Chester, Pa., and Bridgeport, N. J., for Transcontinental Gas Pipe Line Corporation.

FPC Grants Transwestern Approval to Build Lines

Transwestern Pipeline Company has been granted authorization to construct 250 miles of various diameter gathering lines and install three compressor stations with a total of 8040 hp. The project will cost about $8 million.

Joyce Western Lays Line Under Airport

Joyce Western Corporation installed a 3,000-foot crossing under the Greater Pittsburgh Airport in completing an 11-mile, 20-24-inch line for Peoples Natural Gas Company and Manufacturers Light and Heat Company. Above contractor is making 900-foot crossing under runway inserting 24-inch casing for 20-inch pipe. The pipe used for crossings was 0.312-inch wall thickness.

Trunkline-Mississippi Hearing Set for Sept. 7

The Federal Power Commission has scheduled a hearing on the expansion proposal of Trunkline Gas Company and new construction planned by Mississippi River Transmission Corporation, a subsidiary of Mississippi River Fuel Corporation.

Trunkline plans to lay 154 miles of 30-inch main line loops and 74 miles of laterals at a cost of $25 million. This is part of Trunkline's $45 million application involving over 250 miles of loops and 140 miles of laterals. Mississippi River Transmission would lay 94 miles of line from Trunkline's system in Clay County, Illinois, to the St. Louis, Mo., area. Cost of Mississippi's project is estimated at $9 million.

Russia Building 2,795-Mile Crude Oil Pipe Line System

A crude oil pipe line network is underway in Russia designed to furnish crude to Poland, East Germany, Hungary, and Czechoslovakia. The line will extend over 2,795 miles from the Kuibyshev region on the Volga and will also serve areas en route to major delivery points.

The line will be 20 to 24-inch diameter with about 50 pump stations installed to move crude. Completion of the line has been set for 1964. Capacity will be 290,000 barrels of crude daily.

From Kuibyshev it runs as far as Mozyr where it splits into two branches, the northern and southern sections. The northern section continues across Poland to Schwedt, in East Germany. The southern portion extends from Mozyr to Uzhgorod into Czechoslovakia and Hungary. This section will be 1,055 miles long.

Northern Natural Receives FPC Temporary Approval

The Federal Power Commission has granted Northern Natural Gas Company and Colorado Interstate Gas Company temporary authorization to construct facilities estimated to cost $4.7 million.

Northern will lay 20 miles of small diameter pipe and install 4,000 hp to enable it to withdraw 100 MMcf of gas daily from St. Peter-Elgin portion of Redfield storage area in Iowa. Also Northern will construct 40 miles of various diameter in the proposed Highland gathering system. Colorado Interstate proposes to construct a 4,500 hp compressor station in Rawlins.

Border Gas Transmission Gathering Company Formed

Border Gas Transmission Company has been formed to build a $10 million gas gathering in south Texas. The gathering system will be 300 to 400 miles and will deliver 150 MMcf of gas daily to Texas Eastern Transmission Corporation.

The line would extend through Webb, Zapata, Starr, Jim Hogg, Brooks, Dimmit, Zavala, Maverick and La Salle counties.

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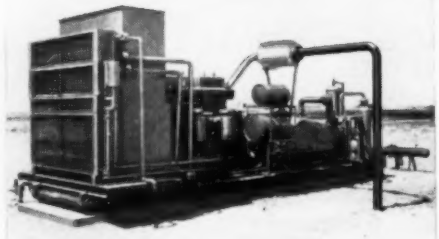

Waukesha 3520 cu. in. engine on heavy duty compressor application—Texas

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Trans-Canada Moves Toward Border

Majestic Contractors make a tie-in on the 51-mile, 30-inch lateral line Trans-Canada Pipe Lines Limited is constructing from Winnipeg to Emerson, Manitoba near the United States border. The line will supply 204 MMcf of gas daily to Midwestern Gas Transmission Company, which is laying a 504-mile, 24-inch line from Emerson to Marshfield, Wis.

Michigan Wisconsin Receives Approval on Major Expansion

Michigan Wisconsin Pipe Line Company was granted authorization for its $44 million expansion project consisting of 567 miles of pipe line and 6,000 additional horsepower.

Michigan Wisconsin will lay 341 miles of 24-inch paralleling its main line between Kansas and Illinois. Expansion included 188 miles of 30-inch in Michigan and 36 miles of small diameter loops on existing lines in Wisconsin.

The new facilities will enable Michigan Wisconsin to deliver peak requirements of 1,396 MMcf of gas daily including volumes from storage.

Contracts on this work already have been let to R. H. Fulton & Company, Bechtel Corporation, Somerville Construction Company and Majestic Contractors.

Gulf Refining Company Sells Crude Line System

Gulf Refining Company has sold a 152-mile crude line from Mississippi to an Alabama Port to Eddy Scurlock, chairman of Scurlock Oil Company, and Leon Hess.

The line is a steam-heated crude line carrying crude from Heidelberg, Eucutta, Yellow Creek and Baxterville fields in Mississippi to Mobile. The line consists of 64 miles, 10-inch, and 88 miles, 14-inch.

Ohio Fuel Gas Awards Contracts on Gas Lines

Ohio Fuel Gas Company has awarded contracts on several lines in Ohio. H. L. Gentry Company will lay 5 miles of 24-inch from Maumee to Toledo. Ohio Pipe Line Construction Company will make several line changes for Ohio Fuel due to highway changes. These include changes in lines 2-inch through 24-inch near Sandusky, Logan and Circleville.

San Diego Lets Contract To Stanley-Bledsoe Corp.

San Diego Gas & Electric Company has awarded a contract to Stanley-Bledsoe to lay a 51-mile, 30-inch gas line from Rainbow meter station to San Diego., Calif.

Southern Natural Acquires Timcoat Corporation Plant

Southern Natural Gas Company has acquired all interests in Timcoat Corporation, which previously had been operated by Brown and Root, Inc., and owned by Brown and Root and Southern Natural. It will be wholly owned subsidiary and operated as a separate company.

Timcoat has been in operation since 1956 as an asphalt mastic coating applicator. The plant is located in New Orleans.

"320" and "240" open 3 miles per day for Texas gas line

For real trench production there's nothing like a Cleveland. H. B. Zachry's Superintendent Ray Shields reports an average 3 miles of 40" x 54" trench per day with a Cleveland 240 and the Cleveland 320 shown here on an 81-mile section northwest of Fort Worth, for Old Ocean Fuel's 374-mile natural gas line from Graham to the Texas Gulf.

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PROPOSED PIPE LINE CONSTRUCTION

Here in convenient summary form is Pipe Line Industry's listing of company, line size, length, service, location and project status.

U.S.

Algonquin Gas Transmission Co., Boston, 25 miles, 20-inch; 8 miles, 8-inch, gas, and 12,000 hp addition in Massachusetts, $6 million, before FPC.

Arkansas Louisiana Gas Company, Shreveport, La., 58 miles, 2-6-inch, gas, planned.

Belle Fourche Pipeline Co., Casper, Wyo., 103 miles, 8-inch, crude, Fiddler Creek field to Lance Creek, Wyo., and branch lines from North Donkey Creek field to Rozet and Miller Creek fields, $2¾ million, approved by Wyoming Public Service Commission.

Border Gas Transmission Company, 300 to 400 miles, gas, gathering, in south Texas, $10 million, planned.

LESCHEN WIRE PORTER ROPE DIVISION
H. K. PORTER COMPANY, INC.

Buckeye Pipe Line Co., New York, 54 miles, 16-22-inch, crude, main lines from Toledo to Samaria, and Detroit, Mich., $4 million, contract let on 41 miles of 16- and 22-inch to **Panama Williams Corp.** and **Somerville Construction Co.**

Carolina Pipeline Company, Columbia, S. C., 85 miles, 8-inch, gas, in South Carolina, $5 million, before FPC.

Coastal States Gas Producing Co., Corpus Christi, Texas, 60 miles, 10-inch, gas, gathering, La Salle and Frio counties, Texas, before FPC.

60 miles, small diameter, gas gathering line, to tie in with system under construction and extend to Pearsall County, Texas, planned.

25 miles, gas, Associated Gas & Oil Co. field to South-Tex Corp., processing plant west of Corpus Christi, Texas, planned.

37 miles, gas gathering in Brown, Eastland, Comanche and Erath counties, Texas, planned.

Coastal Transmission Corp., Houston, 81 miles, 3 to 10-inch, gas, laterals; 5,500 hp in stations at Port Lavaca, Texas, and Eunice, La., and additional 1,500 hp at Robstown, Texas, $6.2 million, before FPC.

Colorado Interstate Gas Co., Colorado Springs, 140 miles, 34-inch, gas, Green River, Wyo.,-to-Provo, Utah; 109 miles, 26-inch, Texas Panhandle to southeastern Colo., 136 miles, 34-inch, southeastern Colorado-to-Pueblo, Colo.; 107 miles, 30-inch, Pueblo-to-Denver, $91 million, FPC examiner approval.

Colorado Oil & Gas Corp., Denver, 400-miles, gas, from Gubik field to Fairbanks, Alaska, planned.

Columbia Gulf Transmission Co., Houston, 12.8 miles, 6 and 20-inch, gas, loop line in Louisiana, $730,000, authorized.

East Coast Pipeline Co., 90 miles, 12- to 24-inch, products, Linden, N. J. to Suffolk County, N. Y., $25 million, planned.

El Paso Gas Supply Company, El Paso, Texas, 228 miles, 30-inch, gas, main, Live Oak to Sutton County, Texas, $30 million, planned.

El Paso Natural Gas Company, El Paso, 199 miles, 30-inch, Permian-San Juan crossover loop, before FPC.

17 miles, from Pacific Gas Transmission Co. facilities to near Spokane, Wash., before FPC.

34 miles, 20-inch, Puckett to Goldsmith, before FPC.

23 miles, 20-inch, Goldsmith to Eunice-Plains line, before FPC.

9 miles, 20-inch, Goldsmith-Plains loop, before FPC.

43,600 hp in new and existing stations in Texas, Oklahoma, New Mexico and Utah, before FPC.

400 miles, 34-inch, Salt Lake City, Utah, to California border, FPC examiner approval.

El Paso Natural Gas Products Company and **El Paso Products Pipeline Co.,** 32 miles, 6-inch, crude, from Patrick Draw

Continued on Page 80

FREE report tells how to speed up pump-station maintenance

How to speed up maintenance of pumping stations is told in this specially prepared technical service report.

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- Cleaning electric motors, generators, control panels, etc.
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- Storage tank cleaning
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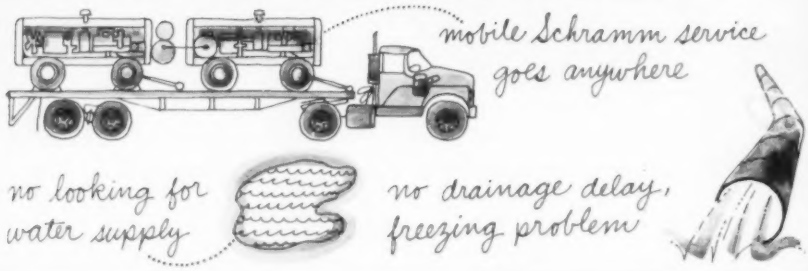
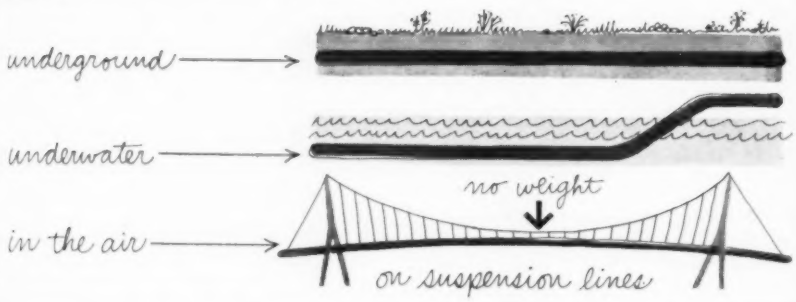
TEST PIPELINES FASTER, EASIER... CUT COSTS...WITH COMPRESSED AIR!

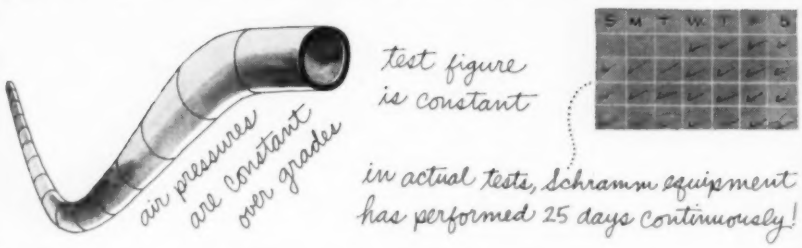
1 Schramm-boosted air ends water problems



2 you can test any line . . . to 1500 psi!

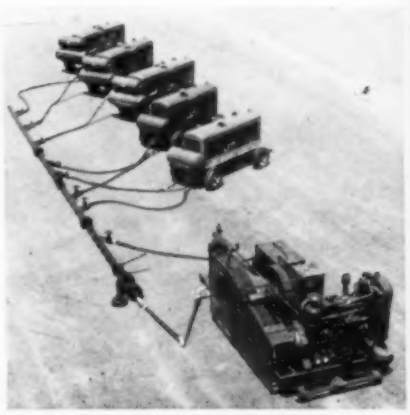


3 compressed air testing is 100% dependable


air pressures are constant over grades
test figure is constant
S M T W T F S
in actual tests, Schramm equipment has performed 25 days continuously!

4 rent or buy the complete Schramm package

three 600 cfm compressors
+ two 1-D booster units
+ one PPC booster unit
delivers 1635 cfm at 1500 psi
rental includes delivery to test site and experienced operator



Write Schramm for full information on pneumatic testing, including estimating chart.

Schramm AIR COMPRESSORS

740 North Garfield Ave., West Chester, Pa.

PROPOSED CONSTRUCTION

continued

Oil and Gas Field to Wamsutter, Sweetwater County, Wyoming, before Public Service Commission.

Equitable Gas Company, Pittsburgh, Pa., 31 miles, 16-inch, and 26 miles, 20-inch, in West Virginia and Pennsylvania, $5 million, before FPC.

Goliad Corp., Houston (Joint venture with **Union Oil Co. of Calif.**), 85 miles, LPG, Kaplan, La. to Baton Rouge, extraction plant at Kaplan and fractionation plant at Baton Rouge, $12 million, planned.

Great Northern Railway, St. Paul., 110 miles, crude, fields in Burke and Bottineau counties to Minot, N. D., $3½ million, contract let on 50 miles to **Curran and Company.**

Hope Natural Gas Co., Clarksburg, W. Va., 45 miles, gas, from West Virginia to Pittsburgh area, planned, 20 miles, 24-inch, gas, in Wertzel and Monongalia counties, W. Va., authorized.

Houston Texas Gas & Oil Corp., St. Petersburg, Fla., 199 miles, 2 to 6-inch, gas, laterals; 20,000 hp in five new stations; $12 million, before FPC.

Iron Ranges Natural Gas Co., 115 miles, gas, from Itasca and St. Louis counties along route of Mesabi range from Grand Rapids to Aurora, Minn., $5 million, FPC authorization.

60 miles from Duluth to Silver Bay, Minn., FPC authorization.

Kansas-Nebraska Natural Gas Company, Hastings, Neb., 165 miles, 2-8-inch, gas, extension from Alliance, Neb., to Chadron, Crawford, Hemingford, Hay Springs, Gordon and Rushville, Neb., before FPC.

45 miles, 2-3-inch, gas, in Kansas, approved by Kansas Corporation Commission.

2,000 hp addition at Scott City, Kan., FPC approval authorization.

2,500 hp addition at Holcomb, Kan., before FPC.

Laclede Gas Co., St. Louis, 107 miles, 24-inch, gas, Hallsville to St. Louis, Mo., planned.

Lo-Vaca Gathering Co., 230 miles, 6-20-inch, gas, gathering, Live Oak to Lavaca County, Texas, planned.

Manufacturers Light and Heat Company, Pittsburgh, 103 miles, 20-inch, gas, in Franklin, Adams, Fayette, Green, Fulton and Somerset counties, Pa., $7 million, contract let on 70 miles to Williams Bros. Co.

Matador Pipe Line Corp., Denver, 175 miles, crude, from Bottineau, Burke and Renville counties, N. D., to Cromer, Man., Canada, $4 million, proposed.

Michigan Wisconsin Pipe Line Co., Detroit.

37 miles, 6 and 12-inch lateral loops in Wisconsin, before FPC.

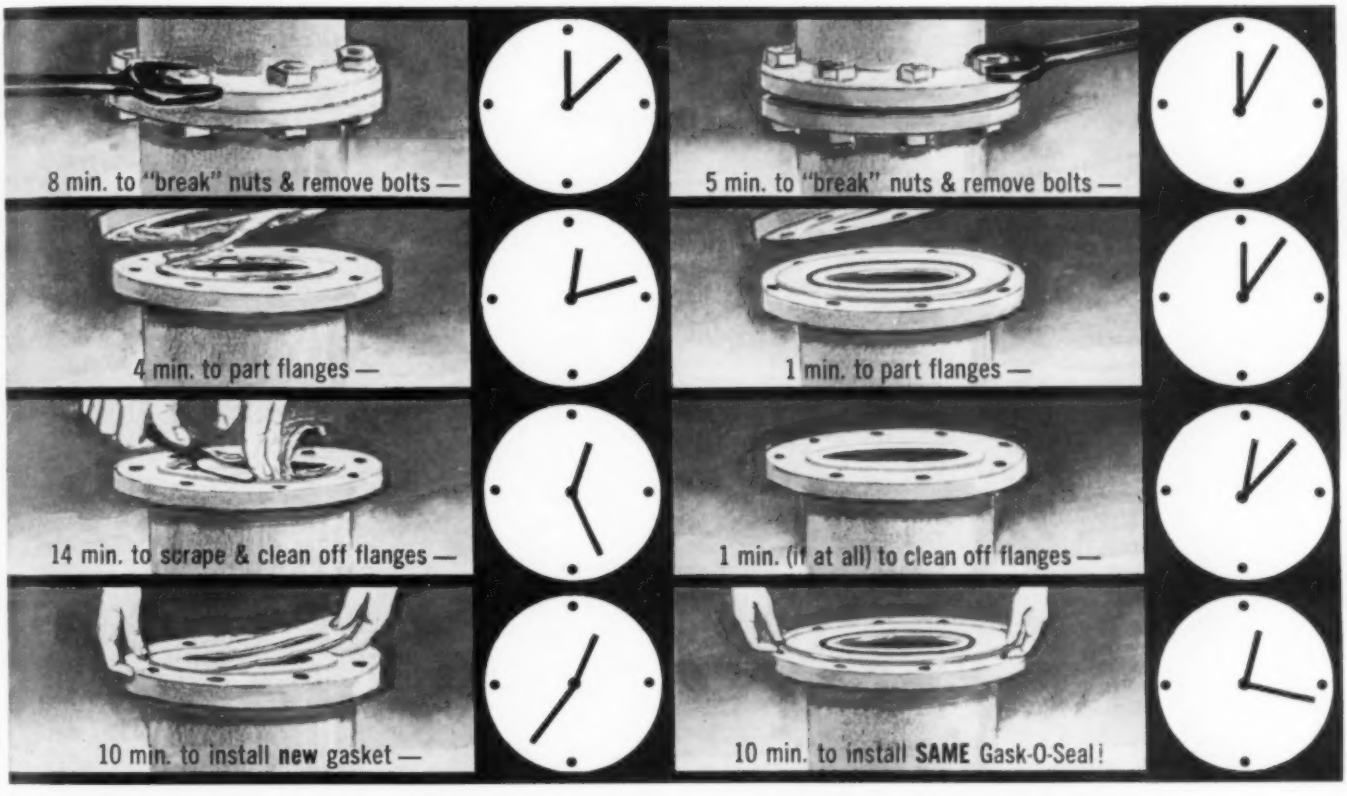
29 miles, 30-inch, loops, Illinois, Indiana, and Michigan, 3,000 hp. station, Janesville, Wis., before FPC.

Two 2,000 hp units at Meade, Kansas; one 2,000 hp unit at Havensville, Kansas, before FPC.

Continued on Page 84

HOW TO SAVE *19 MINUTES* EVERY TIME YOU REPLACE A GASKET!

WITH ORDINARY GASKET | **WITH GASK-O-SEAL**


8 min. to "break" nuts & remove bolts —
4 min. to part flanges —
14 min. to scrape & clean off flanges —
10 min. to install new gasket —
5 min. to "break" nuts & remove bolts —
1 min. to part flanges —
1 min. (if at all) to clean off flanges —
10 min. to install SAME Gask-O-Seal!

TOTAL TIME 36 MINUTES | **TOTAL TIME 17 MINUTES**

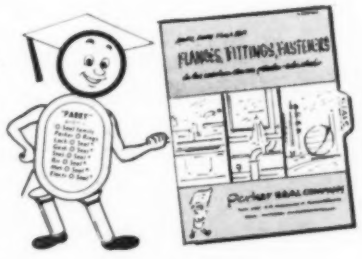
Fourteen major industrial plants report that it takes an **average** of 36 minutes to replace an ordinary gasket in standard ASA flanges . . . **with Gask-O-Seals it takes less than 17 minutes!**

There is no scraping or time consuming cleaning of flange faces necessary when you use Gask-O-Seals; no damaged flanges to be re-surfaced or replaced. And, Gask-O-Seal offers many other cost reducing features:

- They will not "blow-out".
- No retorquing of bolts is necessary.
- Vibration or pulse does not effect seal.
- They provide an opportunity to up-grade flanges — to reduce weight, bulk, bolt sizes and numbers . . . plus many more features.

Why not find out how Gask-O-Seals can save **you** time and effort. We'll be glad to send you complete information.

Write for Catalog 5422



Parker SEAL COMPANY
Culver City, California and Cleveland, Ohio
A DIVISION OF PARKER-HANNIFIN CORPORATION

For more data on advertised products, use Readers' Service Cards, last page.

A COMPLETELY NEW RUBBER

The BLUE OX SIDE BOOM

Designed and built by FWD as the only integral unit for Pipeline Construction.

A rugged, time and money saving tool, with a lifting capacity of more than 6 tons.

Powered by the big, heavy-duty 150 H.P. BD-308 engine, this rig can lug down to creep speeds of ½ MPH at *full-throttle* or be driven over the road from job to job at speeds up to 47 MPH.

Four-wheel drive, and heavy-duty lug-type tires, give the Blue Ox plenty of traction in sand, mud and off-highway operations.

Four-wheel power steer allows tight turning circles on narrow rights-of-way and busy city streets. No worry either about curb or pavement damage with the rubber-tired Blue Ox.

Low center of gravity, balanced weight distribution, and hydraulic operating controls make the FWD Blue Ox Side Boom the most outstanding new pipe-laying rig in use today.

Low Initial Cost
Low Maintenance Cost
Low Operating Cost
High Production

For convincing proof, ask your FWD Dealer for a demonstration or mail handy coupon for full details.

Independent control of rear steer permits the FWD SIDE BOOM to turn in a circle of six feet inside radius.

The FWD SIDE BOOM can be equipped with hydraulically operated angular blade for back-fill and clean-up jobs.

The new FWD SIDE BOOM can unload and string 20 in. gas line pipe with ease. Its mobility and slow creep speed of ½ MPH make it ideal for lining up and spotting pipe.

Handling two 2,500 lb. concrete anchor weights in swamp area presents no problem with the FWD SIDE BOOM. Hydraulically controlled winches simplify lowering and placing.

The FWD SIDE BOOM is at its best in tight, congested areas. Its four-wheel drive and steer, slow creep speed, permit safe operation under city and suburban conditions.

-TIRED PIPE-LAYING RIG

No "lowboy" required with the FWD SIDE BOOM. Its legal width permits it to travel "down the road" at speeds up to 47 MPH.

Blue Ox

*Blue Ox is an FWD TRADEMARK

SPECIFICATIONS

Weight — 18,400 lbs.
Boom Length — 14 ft.
Over-all Width — 96 in.
(with counterweight extended, 129 in.)
Wheelbase — 106 in.
Winches — Two Hydraulic Drive
Steering — Front Axle Hydraulic Power Assist
Rear Axle Full Hydraulic Power
Engine BD-308 — 150 H.P.
Transmission — Speeds — 5 forward, 1 reverse
Tires — 16.00 x 20 - 14 ply
Tread — 76 in.
Ground Clearance — 13 in.
Electrical System — 12 volt

FWD® CORPORATION

FWD Corporation
Clintonville, Wisconsin, U.S.A.
Canadian Factory, Kitchener, Ontario

Send complete data on Blue Ox SIDE BOOM

Name _____

Title _____

Company _____

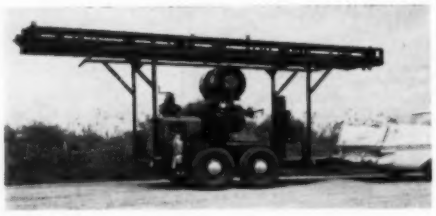
Street _____

City _____ State _____

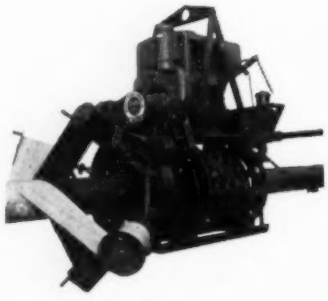
MYOCO...

For More Dependable Equipment and Service

HERE ARE MACHINES THAT BRING ADDED EFFICIENCY TO YOUR TAPING AND CLEANING AND TAPING.



The Myoco fully portable type stationary, semi-automatic, cleaning, priming and tape wrapping machine, is quickly and easily moved from one jobsite to another by passenger automobile or pick-up. Powered with air-cooled Wisconsin motors. Sizes 2" thru 6" inclusive.



MYOCO Model OW Power Driven Cleaning and Taping machine combines two operations for increased speed of operations with less equipment. Line travel machines are available to handle pipe sizes 3" to 6", 6" to 12", and 14" to 20". A Wisconsin Model Vg4D V-type 4-cylinder heavy-duty air cooled engine, combined with the design and engineering features of this machine, guarantees uninterrupted service.

When you use MYOCO pipeline equipment, you quickly find that servicemen are experienced and available twenty-four hours a day, with fast transportation available to serve you in any way; efficient equipment operation is assured by periodical checks; and if possible, parts and supplies are shipped the same day ordered.

MORRIS-YOUNG-OWENS CO. PIPELINE EQUIPMENT AND SUPPLIES MYOCO

MORRIS-YOUNG-OWENS CO.

PIPELINE EQUIPMENT AND SUPPLIES

P. O. Box 35137 • Houston 35, Texas
PArkview 3-0110

In Canada: MYOCO LIMITED, Rural Route 1, Midland Ave. N., Agincourt, Ontario, Canada. Tel. WA 2-9444

PROPOSED CONSTRUCTION

continued

Mississippi River Fuel Corp., St. Louis, 20 miles, 12-inch, 3 miles, 4-inch, gas, 2,500 hp station, to develop underground storage reservoir at St. Jacobs field in Madison and St. Clair counties, Ill., $3 million. Before FPC.

Mississippi River Transmission Corp., (subsidiary Mississippi River Fuel), 115 miles, 18-inch, gas, southeast Missouri to St. Louis County, planned.

Natural Gas Gathering Co., Inc., (joint venture with Gulf Resources, Inc.) gas gathering facilities in Zapata and Starr counties Texas, before FPC.

Natural Gas Pipeline Company, Chicago, 62 miles, gas, pipe line and various river crossings, before FPC.

New Haven Pipeline, Inc., products line, New Haven, Conn. to Springfield, Mass., $2.5 million, planned.

Niagara Mohawk Power Corp., 122 miles, 12-inch, Watertown and Massena, N. Y., contract let to Fulghum Contracting Corporation pending FPC approval.

Northern Natural Gas Company, Omaha, Neb., 236 miles, gas, in Kansas, Nebraska, Iowa, Illinois and Wisconsin, and 14,050 hp, $25 million, before FPC.

124 miles, in Oklahoma, Kansas, Nebraska, Iowa, and Minnesota and 17,360 hp, $17 million, before FPC.

22 miles, in Iowa, $673,100, before FPC.

Northwestern Refining Co., crude gathering system, Rival and Lignite fields, North Dakota, $625,000, Public Service Commission approval.

Ohio Fuel Gas Co., 59 miles, gas, 4-24-inch main lines, in Belmont, Carroll, Cuyahoga, Fairfield, Logan, Lorain, Marion, Muskingum, Stark and Wayne counties, Ohio, $5.1 million, planned.

Pacific Gas & Electric Co., San Francisco, 296 miles, 36-inch, gas, from Malin, Ore., to Antioch, Calif., southern section of line from Canada to California, $82 million, authorized by California Public Utilities Commission.

Pacific Gas Transmission Co., San Francisco, 614 miles, 36-inch, Kingsgate B.C. to Malin, Ore., northern section of Canada to California line, $133 million FPC authorization.

Panhandle Eastern Pipe Line Co., Kansas City, 305 miles, 30-inch, 40 miles, 26-inch, gas, loops, and 43,000 hp, and gathering facilities, $60 million, before FPC.

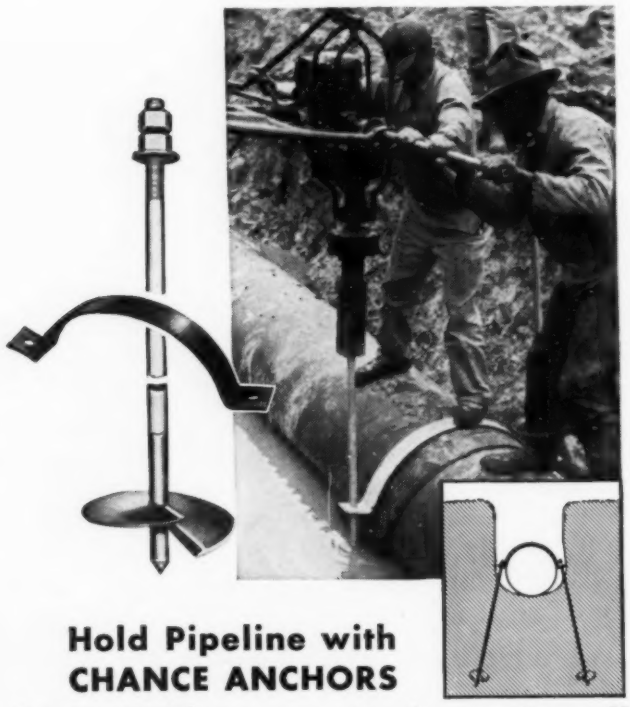
200 miles, 22-24-inch, gas, lateral, from Elk City, Okla., to Haven, Kan., before FPC.

Peoples Gas Light & Coke, Chicago, 29 miles, 36-inch, gas between North Shore and Calumet stations, planned.

Peoples Gulf Coast Pipeline Company, Chicago, 27 miles, gas and turbocharger additions to 71 compressor engines, befor FPC.

Rio Gas Gathering Co., San Antonio, 97 miles, 3 to 8-inch, gas gathering, South

Continued on Page 88



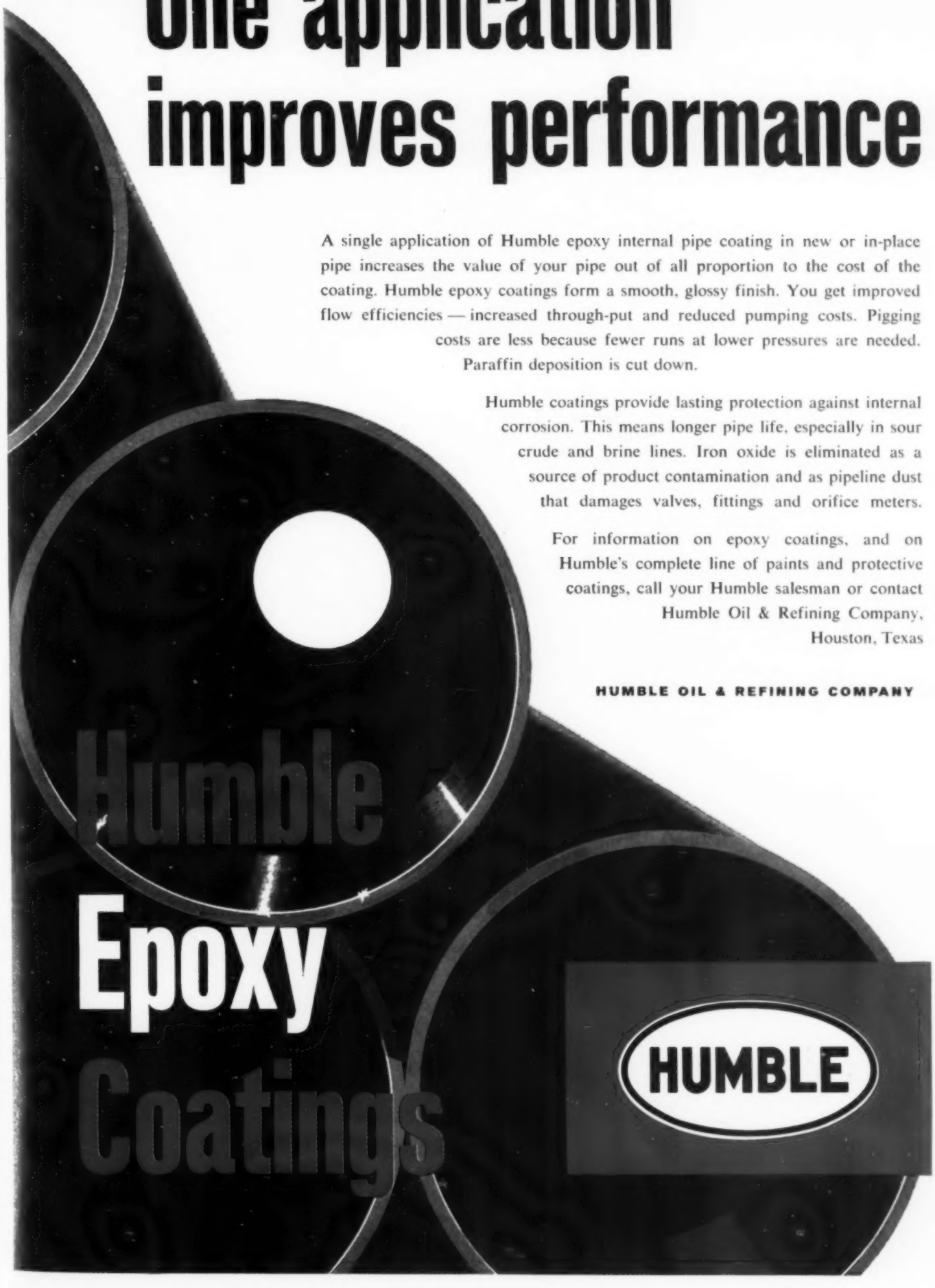
Hold Pipeline with CHANCE ANCHORS

Costs: 85% Less . . . Easier to Install . . . Less Weight to Handle

You can make a better bid, do a better job, do it easier, and make more money with Chance pipeline screw anchors. The cost saving is fantastic, and Chance field engineering and installation service will even do the work.

Petroleum Equipment Engineering And Services Division of
A. B. Chance Co., 1311 Polk Ave., Houston 2, Texas, Phone CApitol 8-2777
INTERNATIONAL DIVISION • CENTRALIA, MO., U.S.A. COSO-16

One application improves performance



A single application of Humble epoxy internal pipe coating in new or in-place pipe increases the value of your pipe out of all proportion to the cost of the coating. Humble epoxy coatings form a smooth, glossy finish. You get improved flow efficiencies — increased through-put and reduced pumping costs. Pigging costs are less because fewer runs at lower pressures are needed. Paraffin deposition is cut down.

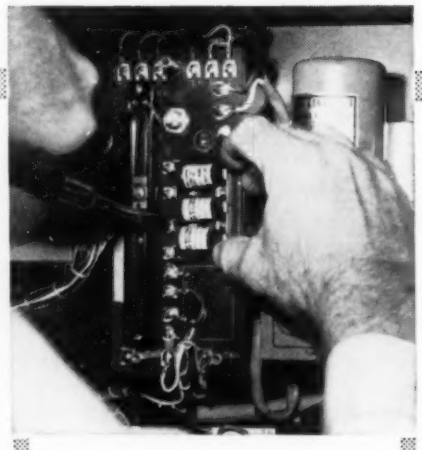
Humble coatings provide lasting protection against internal corrosion. This means longer pipe life, especially in sour crude and brine lines. Iron oxide is eliminated as a source of product contamination and as pipeline dust that damages valves, fittings and orifice meters.

For information on epoxy coatings, and on Humble's complete line of paints and protective coatings, call your Humble salesman or contact Humble Oil & Refining Company, Houston, Texas

HUMBLE OIL & REFINING COMPANY

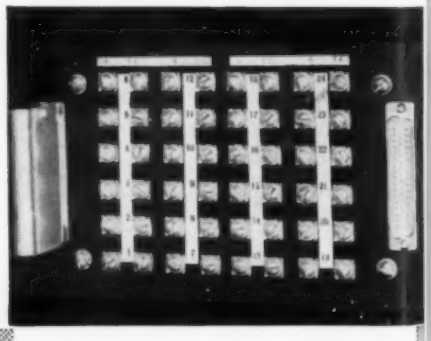
Record 2 to 24 points on the same

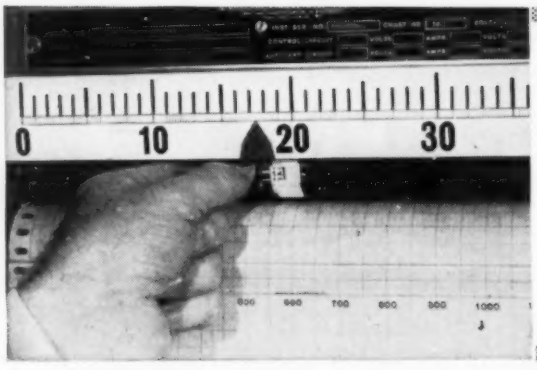
UNIVERSAL *Electronik* RECORDER



New modular design . . . and greater value than ever

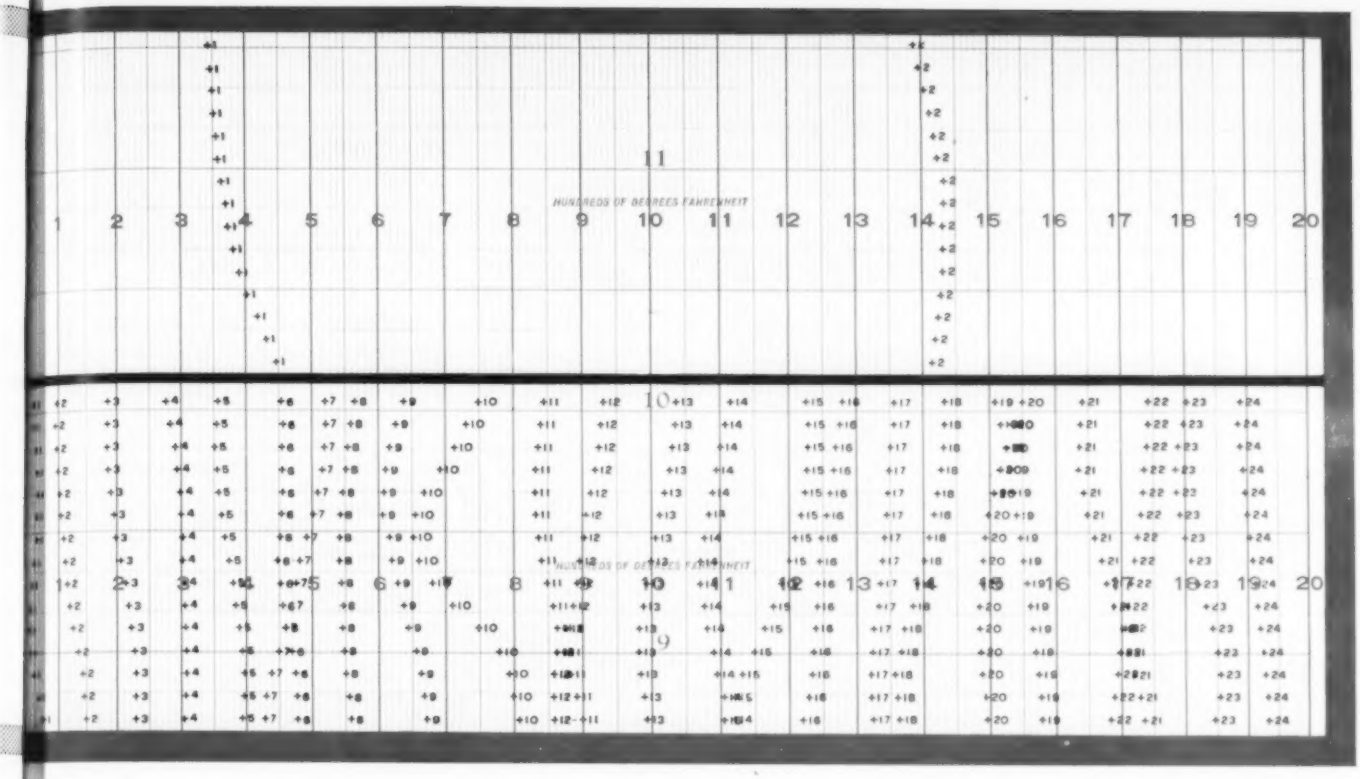
CHANGING RANGE IS EASY—Loosen screws and slide out the range resistor card. Replace with a different card, tighten screws and the job is done quickly and easily.





CHANGING NUMBER OF POINTS IS EASY—First, remove thumb-tight nut; slip off print wheel and indicator dial. Slip on new wheel and dial and replace nut. Second, replace one plug-in unit on extreme right of terminal board, and the instrument is ready to record any desired number of points.

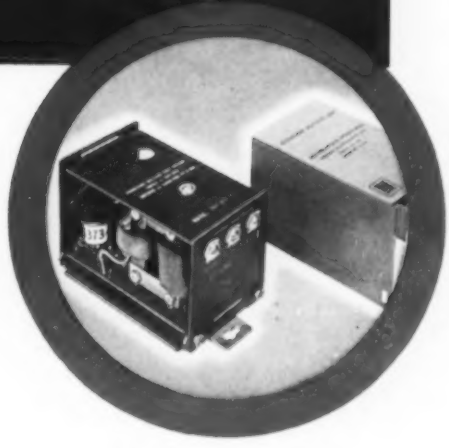
CHANGING COMPENSATION IS EASY—Input terminal board comes out by removing one plug (extreme left) and four screws. Slide in the new board, replace the screws and plug and the compensation is changed. Reference junction is built into terminal board on reverse side.



Now, you can record 2,3,4,6,8,10,12,16,20 or 24 points on one instrument—the new Universal *ElectroniK* Recorder. And you can change the number of points to be recorded in a matter of seconds. It's as easy as this: remove a thumb-tight nut and slip off the old print wheel and indicator dial. Slip on a new wheel and dial and replace the nut. Plug in the number of points wanted, and the job is done.

New modular design makes all *ElectroniK* instruments easier to use and maintain and a greater value than ever. This new design has also resulted in substantial manufacturing economies and appropriate price reductions. Get complete details from your nearby Honeywell field engineer. Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL, Wayne and Windrim Avenues, Philadelphia 44, Pa.



CONSTANT VOLTAGE UNIT (Zener diode) eliminates batteries, standard cells, and standardizing mechanisms.

Honeywell

First in Control

SINCE 1885

75th YEAR

PIONEERING THE FUTURE

For more data on advertised products, use Readers' Service Cards, last page.

Check this DARLING gate valve trio for

UNMATCHED ADVANTAGES

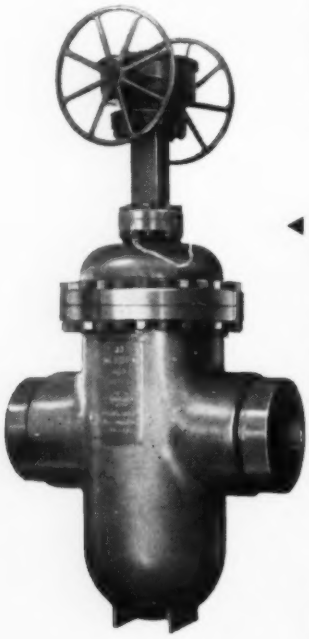
in every oil, gas and petrochemical service

◀ **DARLING FULLY REVOLVING DOUBLE DISC GATE VALVES**

—famous for *consistently* trouble-free operation in all kinds of service. Revolving disc principle assures easy operation, surer closure, minimum friction, automatic seating compensation, extreme life with minimum maintenance. Ask for Catalog 57.

DARLING ALUMINUM ALLOY GATE VALVES ▶

—featuring all the advantages of the above revolving disc principle, *plus* new economies in the handling of "problem" fluids and gases or wherever aluminum piping is used. Ask for Bulletin SLS 5801.



◀ **DARLING-McEVOY SELF-SEALING CONDUIT VALVES**

— the *only* conduit gate valve with *sealant gasketing* between gates and seats. Every closure leakproof! This and other advantages proved by outstanding performance on major lines. Get *all* the facts. Ask for Catalog 57.

Whatever the service, in any phase of pipelining, gathering or processing, these Darling gate valves offer worthwhile features and advantages unobtainable in other valves. The catalogs referred to above are available to give you the pertinent facts.

DARLING TRADE DARLING MARK VALVES

DARLING VALVE & MANUFACTURING CO.

Williamsport 27, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ontario

PROPOSED CONSTRUCTION

continued

Texas, to supply gas to El Paso Natural Gas Company, planned.

Southern California and Southern Counties Gas Cos., Los Angeles, 93 miles, 34-inch, California-Nevada border to Newberry, Calif., approved.

St. Lawrence Gas Company, Inc., Ogdensburg, N. Y., 75 miles, gas, main, United States-Canadian border to Ogdensburg, N. Y., $3.4 million, FPC examiner approval.

Tennessee Gas Pipeline Co., Houston 191 miles, 30 and 36-inch loops, in Ohio, Pennsylvania and New York, 72 miles of gathering lines and 43,600 hp in five stations, $46 million before FPC.

158 miles, 36-inch, gas, loops in Mississippi and Louisiana, FPC authorization.

21 miles, 16-inch, 2 miles, 12-inch, gas, Louisiana coast, Vermilion blocks 46 and 64, $3 million, before FPC.

Teton Pipe Line Corporation, Wyoming, crude system consisting of 6-inch line from Miller Creek Oil Field in Crook County to the Rozet Oil Field, Campbell County; 100 miles, 8-inch, Rozet to Salt Creek Oil Field, Natrona County; 6-inch, Natrona to Dead Horse and Barber Creek Fields in Campbell and Johnson counties, and gathering facilities, denied by Public Service Commission.

Texas Eastern Transmission Corp., Shreveport, La.

66 miles, 30-inch, gas, loops, between Vidor, Texas and Lambertville, N. J., and 33,710 hp in four existing stations, $17.5 million, before FPC.

90 miles, LPG, Lebanon to Lima, Ohio, planned.

Extension of products line from Lebanon, Ohio, to Elmira, N.Y., considered.

350 miles, 24-inch, coal slurry, West Virginia to New York, considered.

Texas Gas Transmission Corporation, Owensboro, Ky., 23 miles, 30-inch, gas, loops, between Eunice and Bastrop, La., 56 miles, 12-inch, in Indiana. $8 million, contract let on 12-inch to **Western Pipe Line, Inc.**

Transcontinental Gas Pipe Line Corporation, Houston.

211 miles, 36-inch, and 69 miles, 30-inch, loops and additional 32,040 hp, in Texas, Louisiana, Mississippi, Alabama, Georgia and South Carolina, $52 million, FPC examiner approval.

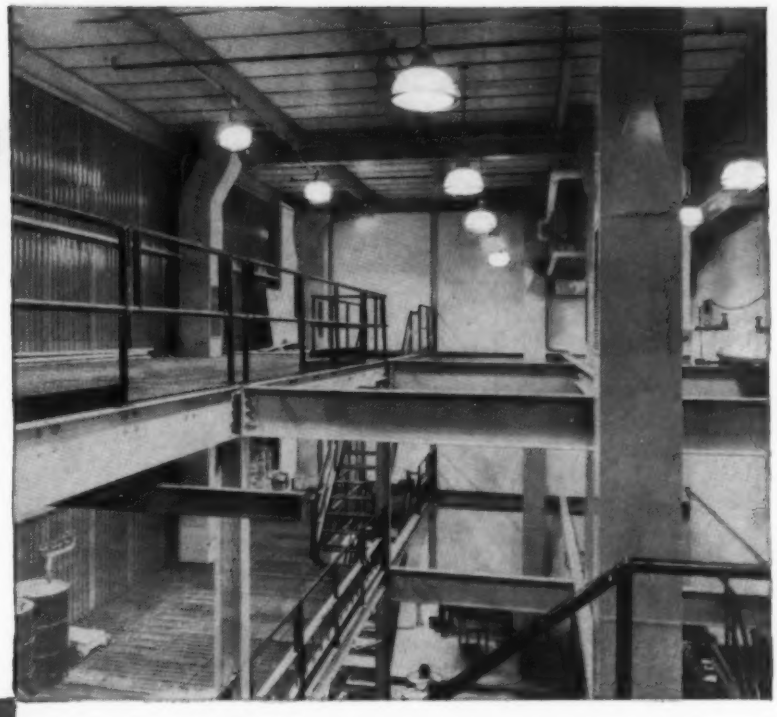
13 miles, 24-inch and 18 miles, 20-inch loops, Louisiana, FPC authorization. 14 miles, 16-inch laterals, 1-mile, 12-inch lateral, Louisiana, $2.1 million, FPC authorization.

29 miles, 20-inch, gas, and 2,500 hp, in South Texas to take gas from South Texas Natural Gas Gathering Co., $2.4 million, before FPC.

Continued on Page 90

LIGHT

exactly where you need it...



Crouse-Hinds Explosion-Proof Lighting Fixtures in Class I, Group D location

Crouse-Hinds Vaportight Lighting Fixtures in a corrosive outdoor location

regardless of surrounding atmosphere!

When there's something in the air — explosive gases, ignitible dusts, corrosive fumes — Crouse-Hinds has exactly the light to give you lighting exactly where you need it — with complete safety!

Lighting that's safe to operate in explosive concentrations of acetylene . . . hydrogen . . . gasoline vapors . . . organic, inorganic or metallic dusts. Lighting that stands up under the corrosive attack of acids, salts, alkalis.

What *kind* of lighting do you need: Bench . . . area . . . flood? Incandescent . . . fluorescent . . . mercury vapor? Permanent . . . portable?

You'll find them all in the Crouse-Hinds catalog. It's the *only* place you'll find lighting for every Class and Group under the National Electrical Code.

Ask your Crouse-Hinds Distributor.

Crouse-Hinds Dust-Ignition-Proof Lighting Fixtures in grain elevator — a Class II, Group G location

CROUSE HINDS
SYRACUSE NEW YORK

OFFICES: Atlanta Baton Rouge Birmingham Boston Buffalo Charlotte Chicago Cincinnati Cleveland Corpus Christi Dallas Denver Detroit Houston Indianapolis Kansas City Los Angeles Milwaukee New Orleans New York Omaha Philadelphia Pittsburgh Portland, Ore. St. Louis St. Paul Salt Lake City San Francisco Seattle Tulsa Washington
RESIDENT REPRESENTATIVES: Albany Baltimore Reading, Pa. Richmond, Va.
Crouse-Hinds of Canada, Ltd., Toronto, Ont. Domex, Mexico City, D.F. Peterco, Sao Paulo, Brazil

For Speediest Repair of Corrosion Leaks in Pipe

JUNIOR

EMERGENCY PIPE CLAMP

Repair pipe leaks QUICKLY!

Speediest application — slotted lug permits the single plated bolt to slide instantly into place.

A companion to the old reliable Emergency Pipe Clamp that has served industry for a half century, the JUNIOR, a single bolt clamp, is 2⅞" wide. Undersells most band-type clamps.

Made of malleable iron, ruggedly proportioned, with full-length hinge along one side. Formed to exact pipe size—no bending. The recessed pressure-equalizing gasket, entire width of clamp, is cemented in. A lasting installation. 2" pipe size—$1.80; 2½"—$2.20; 3"—$2.30. Write for new circular on the Junior.

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PROPOSED CONSTRUCTION

continued

Transwestern Pipeline Company, Houston, pipe line facilities to cost $5.4 million to make available additional gas reserves for the line presently under construction, FPC authorization.

Trunkline Gas Company, Houston, 252 miles, 30-inch loops, and 140 miles, laterals, between Longville, La., and Tuscola, Ill., $45 million, before FPC.

Underground Storage & Exploration, Upper Darby, Penn., 394 miles, 12-inch LPG, from Moundsville, W. Va. to Newark, N. J., $9 million, approved.

95 miles, 6-8 inch, laterals to Mauch Chunk, Penn., and to Philadelphia, planned.

United Gas Pipe Line Co., Shreveport, La., 59 miles, 36-inch, gas, lateral between Bastian Bay field and Plaquemines Parish, La., before FPC.

Valley Gas Transmission, Inc., Houston. 55 miles, 3 to 8-inch, gas, gathering, in Hidalgo, Brooks, Starr and Jim Wells counties, Texas, $15 million, before FPC.

West Shore Pipe Line Co., 250 miles, 10-16-inch, products, East Chicago, Ind., to Green Bay, Wis., planned.

International

ACT Oils, Ltd., Montreal, 400 miles, crude, Dawson Creek, B. C., to Bella Coola, B. C., before B. C. government.

Ajax Alberta Pipeline Ltd., 28 miles, 10-inch, gas, main, Morinville to Westlock, Alta., planned.

Alberta Gas Trunk Line Company, 386 miles, 26-36-inch, gas, main, Berland River area, Alberta, to Alberta-British Columbia border; and 235 miles, 8-18-inch, gas, gathering, Alberta, $100 million, Alberta Oil and Gas Conservation Board, approved.

Alberta Natural Gas Company (Jointly owned by Westcoast Transmission Co. and Alberta & Southern Gas Co. Ltd.) 110 miles, 36-inch, gas, Alberta border to British Columbia-Idaho border, supply gas to Pacific Gas & Electric Co., $40 million, planned.

Assistencia de Oleodutos du Petrobras, Rio de Janeiro, 280 miles, 12-inch, crude, Rio de Janeiro to Belo Horizonte, Brazil, planned.

Abu Dhabi Marine Areas Ltd., (British Petroleum Co. and Compagnie Francaise Des Petroles) 20 miles, 18-inch, crude, from Umm Shaif offshore oilfield to Das Island, Persian Gulf, planned.

Barnabos Group (Italian Interests), crude line from Venice, Italy, to Insbruck, Austria, with extension to Munich, Germany, planned.

Bituminous Oil Pipeline Co., Calgary, 250 miles, crude, from Athabasca tar sand plant in northeastern Alberta to Edmonton, approved.

British American Oil Co., Ltd., Toronto, 125 miles, gas, Pincher Creek fields to Calgary, Alta., before Alberta Public Utilities Board.

Continued on Page 92

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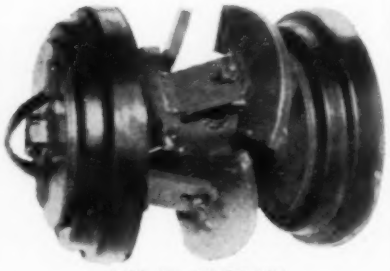

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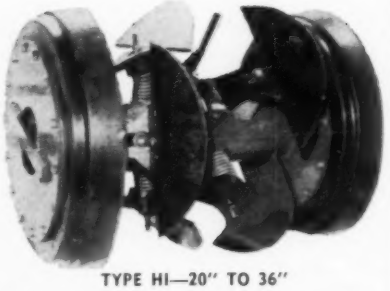

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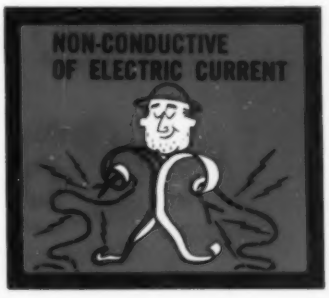

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PROPOSED CONSTRUCTION

continued

Burmah Oil Co., Ltd., 850 miles, crude, 20 inch, from Nahorkatiya to Calcutta. India. Contract let on 250 miles to Mannesmann-Saipem.

Cartier Gas Corp. (St. Maurice Gas, Inc., and Consumers Gas Co., Toronto), 170 miles, gas, Montreal to Quebec City, planned.

Consolidated Gathering Systems, Ltd., Calgary, 198 miles, crude, Sturgeon field to Edmonton, planned.

Creole Petroleum Co., 44 miles, 12-30-inch, gas, Bachaquero to Tia Juana, Venezuela, planned.

Esso Standard Libya, 100 miles, 30-inch, crude, Zeltan oil field to Gulf of Sirte coast, contract let to **Bechtel Corporation.**

Foothills Pipe Lines Ltd., 1,300 miles, LPG, from Alberta-Saskatchewan border to Chicago, tie-in with Westalta Products Pipeline proposed system in Alberta, $100 million, before Alberta Board of Public Utilities Commissioners.

Gas Trunk Line of British Columbia, Vancouver, 250 miles, 30-inch, gas, main, Fort Nelson to Taylor, B. C., planned.

Gases Naturales de Colombia, S.A., 140-mile, 10-inch, gas, Cicuco field to Barranquilla, Colombia, planned.

Hughenden Pipeline, 125 miles, products, Dick Lake gasoline plant to Hughenden Region, Alta., planned.

Hydrocarbons Pipeline, Ltd., Winnipeg, Manitoba, 880 miles, 6-8 inch, products, from Edmonton to Winnipeg, $35 million, partial authorization.

Independent Pipe Line Co., 2,019 miles, 34-36-inch, crude, Edmonton to Montreal, 23,000 pump horsepower, $295 million, before Borden Commission.

Interprovincial Pipe Line Company, 390-mile extension from Toronto to Montreal, looping line from Edmonton to Toronto, crude, $240 million, considered.

Additional horsepower in four new stations and several existing stations, $9.3 million, planned.

Magna Pipeline Co., 25 miles, 4-inch, gas, Vancouver, B.C. to Vancouver Island, $14 million, approved by Public Utilities Commission.

Mid-Continent Pipe Lines, Ltd., 1500-mile, 30-inch crude, Edmonton to Chicago, planned.

Naphtha Israel Oil Co., 75 miles, 6-inch, gas, Rosh-Zohar field to Ashdod Yam on Mediterranean planned.

National Iranian Oil Co., 146 miles, 6 inch, crude, from Azna to Isfahan, Iran, $5 million, planned.

500 miles, 8-inch, products, Teheran to Meshed, Iran, contract let to Williams Bros. Co.

Northern Alberta Pipe Lines, Ltd., Edmonton, Alta., 110 miles, 10-inch, gas, main, Lac La Biche to Edmonton, $3 million, planned.

Northern Pipe Line Company, 153 miles, 16-inch, crude, from Regina, Saskatchewan, to Clearbrook, Minn., $10 million, planned.

Oasis Oil Co. of Libya, 100 miles, 30-inch, crude, Libyan production to Mediterranean, planned.

Peace River Oil Pipe Line Co., Ltd., 70-mile, crude, Swan Hills to Iosegun Junction, approved.

Pembina Pipe Line, Ltd., Edmonton, 1,200 miles, LPG, from Alberta gas fields to eastern Canada, planned.

Petroleos Mexicanos, 4, 6 and 8-inch, products, Mexico City-Puebla to Cuernavaca, planned.

1,240 miles, 34-inch, gas, Reynosa to San Luis Rio Colorado, Mexico, $160 million, negotiating with Tennessee Gas Pipeline Company for design and construction of the line.

8-inch, products, and 12-inch, gas Torreon to Chihuahua, to be built in 1960.

360 mile, 12-inch, products, Minatitlan to Puebla and Mexico City, construction to start in 1960.

Products, Guadalajara to Tepic, planned.

Products, Aguascalientes to Zacatecas, planned.

6-inch, products, Guaymas to Ciudad Obregon, considered.

8-inch products, Guaymas to Hermosillo, considered.

Continued on Page 96

PIPELINE INFLATABLE STOPPERS

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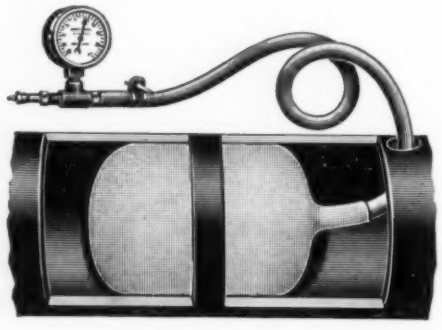

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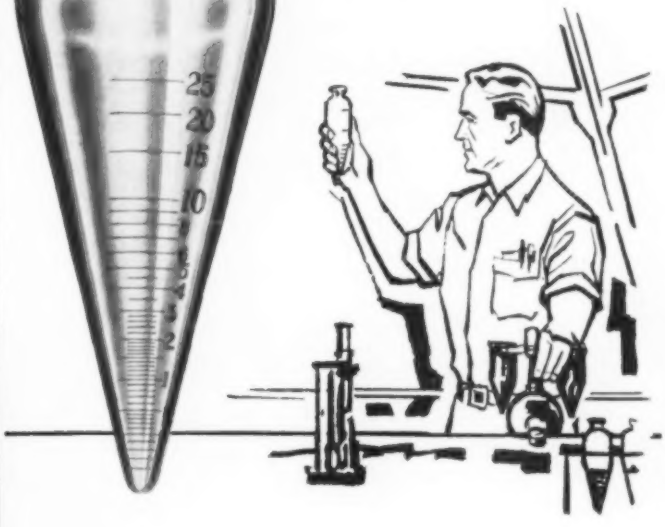

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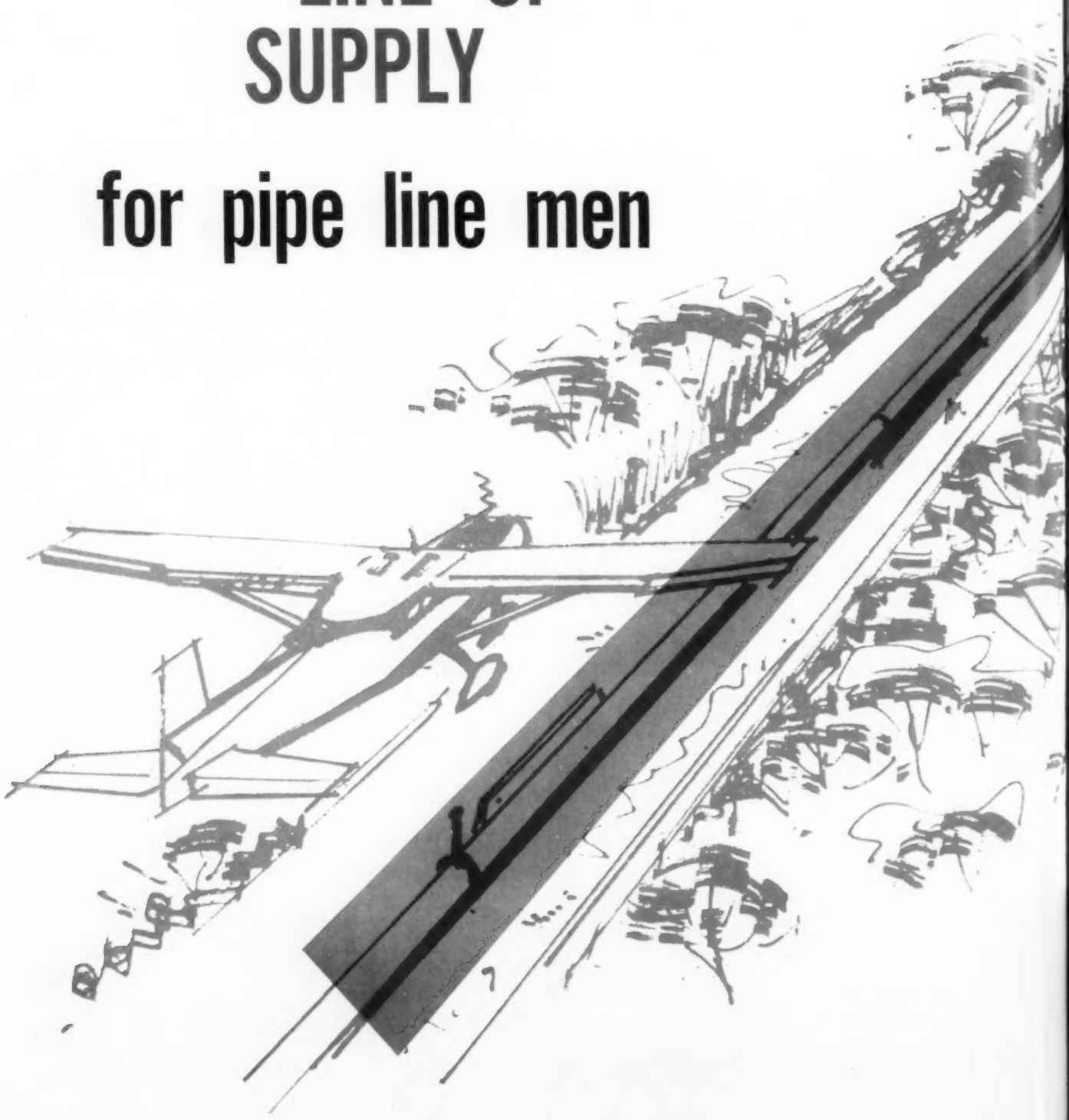

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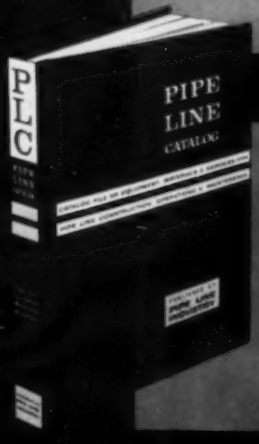

PIPE LINE CATALOG

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PROPOSED CONSTRUCTION

continued

8-inch, gas, Tierra Blanca to Veracruz, to be built in 1960.

14-inch, gas, Mexico City to Salamanca, construction to start in 1960.

Gas, Ciudad Carmen to Ciudad Pemex.

8-inch, crude Comalcalco to Minatitlan, to be built in 1960.

Crude, Minatitlan to Salina Cruz, contingent on proposed refinery on Pacific Coast.

149 miles, 10-inch, products, Ciudad Pemex to Minatitlan, planned.

181 miles, 4-inch, products, Mexico City to Salamanca, planned.

Pipelines of Puerto Rico, Inc., 95 miles, 8-inch, products, Penuelas to San Juan, Puerto Rico, approved.

Provincial Pipe Lines, Ltd., 700 miles, 3-16-inch, hydrocarbon line gathering system in Alberta, $25 million, before Alberta Oil and Gas Conservation Board.

Quebec Gas Transmission Lines, Inc., Montreal, 300 miles, gas, main, Quebec to Montreal, planned.

Rangeland Pipe Line Company Limited, 111 miles, 8-inch, crude, southeastern Alberta to Calgary, $3 million, planned.

Saskatchewan Power Corp., 179 miles, 4-6-8-inch, gas, planned.

Societa Nazionale Metanodotti, 650 miles, 18-inch, crude, Genoa, to Milan-Cremona-Torino, Italy, and Aigle, Switzerland, with extensions to Karlsruhe and Munich, Germany, planned.

Societe d'Etude du Pipe Line Sud-European, Paris, 419 miles, 30-inch, crude, port of Lavera to Strasbourg, with lateral extending 40 miles to Karlsruhe, Germany, approved by French cabinet.

Soc. Siciliana Metanadotti, gas line from Hassi R'Mel field in Algeria through Tunisia, across Mediterranean to Sicily and into Italy, considered.

Standard-Vacuum Oil Company, 60 miles, 8-inch, gas, main, in South Sumatra, considered.

Ste. d-Etudes de Pipeline Intercontinetaux, Paris, 1,400 miles, 30-40-inch, gas, from Hassi R'Mel field in central Algeria across Mediterranean, through Spain, France and into West Germany, considered, Fish International Corporation making engineering and feasibility studies.

Sui Gas Transmission Co., Multan, Punjab, India, 145 miles, 8-inch, gas, from Sylhet to Dacca, East Pakistan, $9 million, considered.

130 miles, 16-inch, gas, main line, Multan to Lyallpur, planned.

Syrian Pipeline, Damascus, 500 miles, crude, from Karshuk field, Syria to Mediterranean, planned.

300 miles, products, from Homs to tank farms in Damascus, Aleppo and Latakia, planned.

Trans-Canada Pipe Lines Limited, Toronto, 50-mile, 30-inch, gas, lateral, Winnipeg to Emerson, Manitoba; 74 miles, 34-inch, loops, additional compressor hp at Swift Current, and Indian Head, Saskatchewan, and Portage la Prairie, Manitoba, $45 million, contract let on 50 miles to **Majestic Contractor, Ltd.**

268 miles, 34-inch, loops, and additional hp planned for 1961, $69 million.

122 miles, 34-inch, loops, hp additions, $46 million, planned for 1962.

Trans-Prairie Pipelines, Ltd., Edmonton, crude line, from Weyburn field to Regina-Moose Jaw areas, $5 million, considered.

Westalta Products Pipeline Ltd., 900 miles, LPG, from Northern Alberta to Saskatchewan border, to deliver hydrocarbons to Foothills Pipe Lines, $40 million, before Alberta Board of Public Utilities Commissioners.

Williams-McWilliams Industries, Inc., New York, 441 miles, 6-inch, crude, Villa Montes, Bolivia to Villa Hayes, Paraguay, considered.

Westcoast Transmission Company, 688 miles, 30-inch, gas, loops, Peace River area of British Columbia to United States border, planned.

Yacimientos, Petroliferos Fiscales Argentina, Buenos Aires, 1,000-mile, large diameter, gas, Comodoro Rivadavia to Buenos Aires, $300 million, considered.

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ON THE LINE

Independents Meet

The annual membership meeting of the Independent Natural Gas Association of America will be held at the Hotel Fontainebleau in Miami Beach, Fla., October 3-4.

Among the featured speakers at the two-day meeting will be Oren Harris, Chairman, House Committee on Interstate and Foreign Commerce; and William L. Webb, Luke R. Lamb and Jerome K. Kuykendall, of the Federal Power Commission. Industry spokesmen will include F. E. Stanley, chairman and president of Houston Corporation; David Searls, Gulf Oil Company, and Athertom Thomas, Consolidated Edison Company.

New directors will be named October 4.

PCGA Annual Meeting

Plans are being finalized for the annual Pacific Coast Gas Association meeting which will be held at Phoenix, Ariz., September 21-23.

The convention theme is "Gas Fueling the Future" and one of the highlights of the sessions will be a Presidents Panel which will include discussion by four PCGA member companies, moderated by association president Walter T. Lucking.

Arizona Governor Paul Fannin and Phoenix Mayor Sam Mardian will address the convention.

Letters

To The Editor:

The May, 1960 issue of your magazine contains a letter to you from Mr. Ernest A. Slade, President of Okan Pipe Line Company. In this letter he makes a comparison for a 24-inch diameter casing, stating that API recommends 0.281-inch wall and AREA requires 0.375-inch wall. Now I do not wish to use your letter column for argumentive purposes but I feel that there are certain facts that should be presented.

As stated in API Code No. 1102, Third Edition, May, 1957, the recommendations for thickness of steel casing pipe contained therein are based on procedures outlined in a paper entitled "The Structural Design of Flexible Protective Casings for Pipe Lines," presented by Professor M. G. Spangler at the 31st Annual Meeting of the American Petroleum Institute. The charts incorporated as part of the API 1102 Code are based on Cooper's E70 railroad loading *as used* by Professor Spangler in his paper when he set forth sample calculations. Now the total weight of a Cooper's E70 locomotive is 497,000 pounds and Professor Spangler considered this load to be uniformally distributed over an area 8 feet by 52 feet at the elevation of the base of the ties. However Cooper's E70 locomotive diagram is made up of 9 axles with load per axle varying from 35,000 pounds to 70,000 pounds. Therefore the total weight cannot be equated to a uniform load per square foot when designing a culvert whose diameter is a small percentage of the total length of locomotive.

Professor Spangles now realizes that the loading he previously used was improper. In his advisory work for Truscon Division, Republic Steel Corporation as published in their Catalog No. G-142, March 1960 he suggests that a static railroad loading consisting of four 72,000 pound axles spaced 5 feet center to center be used. Considering this total load of 288,000 pounds to be uniformally distributed over an area 8 feet by 20 feet gives a load per square foot of 1,800 pounds. This is 50 percent greater than the load originally used by Professor Spangler. Needless to say the API table of casings should be revised for the loading now recommended by Professor Spangler and I warrant it will be found that the casing will approach or exceed the AREA requirements.

/s/ A. J. Wegmann,
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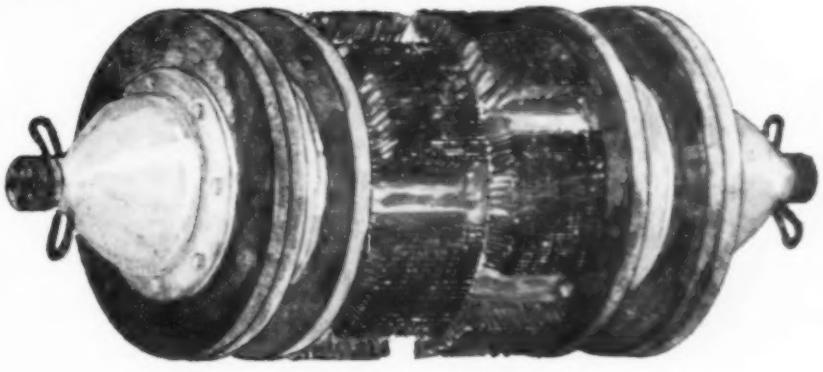

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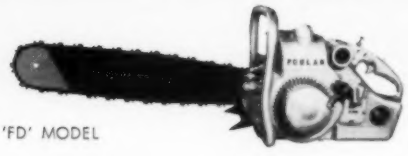

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What's Happening

among MEN in the INDUSTRY

Houston Contracting Company Acquires Rackle Co.

R. P. Gregory, president of Houston Contracting Company, left, and John C. Fitch, president of Rackle Co., inspect precast concrete sections at the Rackle Co. yard in Houston. In acquiring the Rackle company, Gregory commented that this was the first in a series of diversification moves for the contracting firm. Fitch had been vice president and general manager of Rackle, which manufactures precast concrete structures. Gregory becomes a vice president and Albert W. Michael, secretary-treasurer. New directors will include George A. Peterkin, Sr., chairman of board for Houston; H. J. Muckley, vice president of Houston; Paul Dakin, secretary-treasurer of Houston, Fitch and Gregory.

C. C. Wallace has been appointed to the newly created position of assistant general superintendent for **Sun Pipe Line Company's** Crude Lines Department. His headquarters will be in Beaumont. **Jesse D. Duplissey** replaces Wallace as Gulf Coast area superintendent. He had been superintendent of transportation and oil handling for Venezuelan Sun Oil Company. **James E. Ware** becomes assistant Gulf Coast area superintendent.

Wallace has been with the company for 24 years. In 1952, he was named Gulf Coast area superintendent. He had served in various positions in this area since 1926. Duplissey joined the firm in 1940. In 1958, he was transferred to Venezuela. Ware has been with Sun since 1937, and in 1958, he was moved to the Beaumont office as assistant superintendent.

Trunkline Gas Company has announced three promotions in its Engineering Department. **R. C. Newsome** has been named manager of engineering design. He will be in charge of design, material specifications, contract negotiations and supervision of contractors.

Named manager of engineering planning, **A. W. McAnneny** will be responsible for engineering planning, research, service engineering and administrative groups of the department.

H. C. Williams was made administrative assistant to the chief and assistant chief engineer. **L. V. Parent** was appointed supervising engineer, planning, and **L. C. Sullivan** was named supervising engineer, research, both under McAnneny's management. **J. B. Sellers** became supervising engineer, pipe lines, and will head pipe line construction activities under Newsome's direction.

Panhandle Eastern Pipe Line Company has named **Andy L. Fordemwalt** assistant treasurer. He will continue his duties as manager of the Ad Valorem Tax Department. Fordemwalt joined the company in 1939 as a member of the Engineering Department, survey party. He was appointed to his present position in 1958.

D. W. Calvert has been promoted to assistant manager, transportation division, of **Phillips Petroleum Company's** Supply and Transportation Department. He will be responsible for the operation of automotive, railroad and marine transportation equipment. Calvert joined Phillips as a staff engineer in 1952, became supervisor of project development in 1956 and in 1960, was named administrative assistant to the manager of Supply and Transportation Department.

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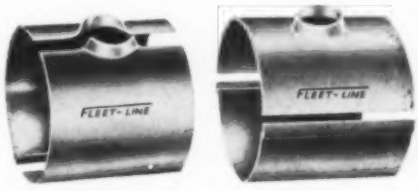

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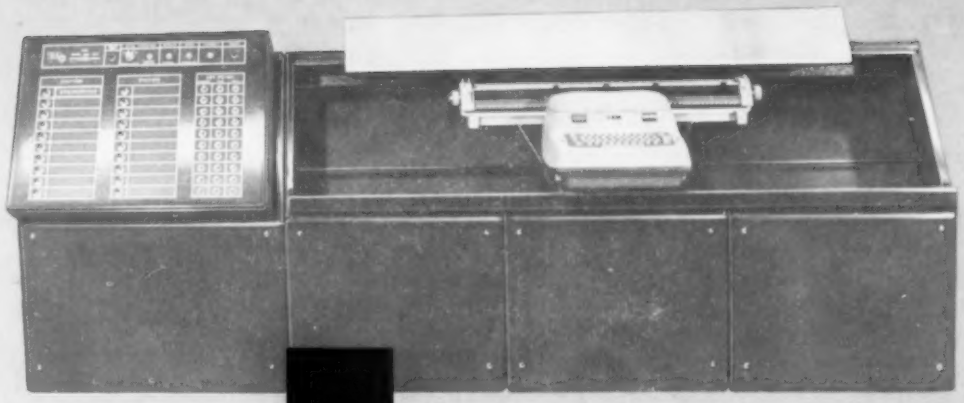
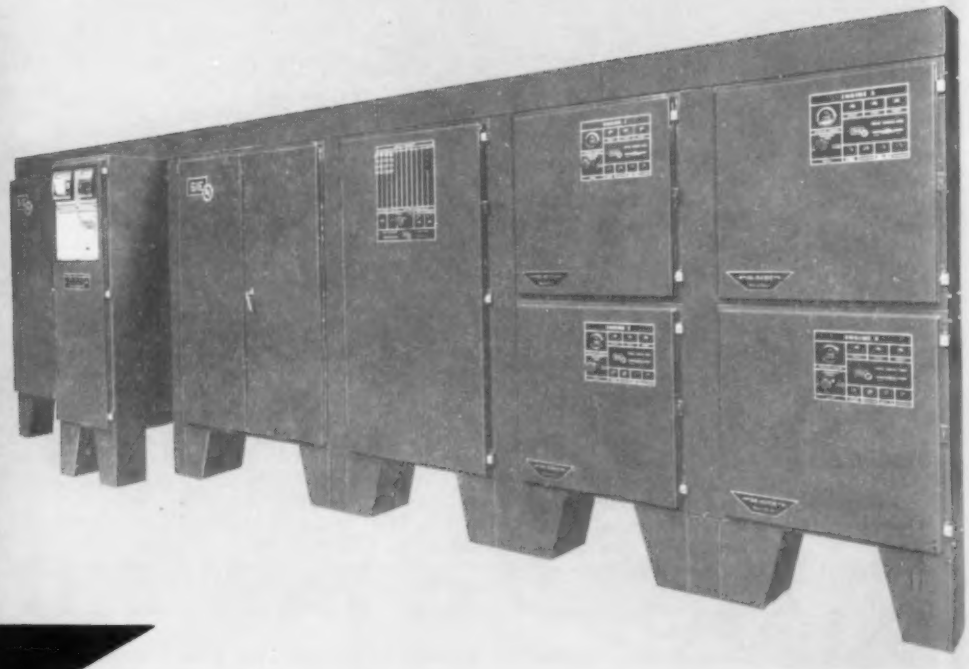


why CIG supervises remotely, automates locally



Colorado Interstate Gas Company dispatchers transmit only desired discharge pressure settings; automation at each compressor station responds by maintaining the selected value for optimum system economy. ■ If communication links fail, local automation operates without interruption. Log-Alarm units insure station safety. Dispatchers are alerted only when trouble occurs. ■ Solid-state components assure maximum reliability. "Building-block" design allows SIE to fit your needs exactly. ■ Accelerate your operating cost reduction program by writing: **SOUTHWESTERN INDUSTRIAL ELECTRONICS**

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Division of Dresser Industries, Inc.

SIE

B. H. Lord, Jr.

James E. Moss

B. H. Lord, Jr., has been appointed director of the Division of Transportation of the **American Petroleum Institute. He succeeds James E. Moss** who retired August 1.

Lord joined the API staff in 1946, and has been the division's associate director during the last year. He served in the Office of Defense Transportation's Division of Railway Transportation in 1942 as assistant to the southern regional director. He later spent three years as a commissioned officer in the U.S. Army's Transportation Corps. He is a member of the District of Columbia Bar and a Practitioner before the Interstate Commerce Commission.

Moss has headed the division since its inception in 1946. He will continue to serve the industry as a special consultant on President Porter's staff. In 1926 he joined the Marine Department of the **Atlantic Refining Co.** and was appointed operating manager in 1935. He assisted the government during World War II with shipping problems and represented industry shipping on the National War Labor Board. He also organized the casualty reporting and analysis system for the U.S. Merchant Marine, and prepared many military tracts and procedures which assisted in saving of life at sea and in the security of vessels and ports. He received the Distinguished Public Serivce Award upon recommendation of the U.S. Navy and Coast Guard and, in addition, the thanks of four committees of the Congress.

F. B. Winbery has been appointed manager of the recently consolidated Dallas district, **United Gas Pipe Line Company,** and Tyler district, **Union Producing Company.** Main office of the consolidated district will be in Tyler. The district's Dispatching Department will be moved to the United Gas Pipe Line office in Carthage, and the Chart Department will be transferred to the United Gas general office in Shreveport. The Dallas office will be closed. **Boyd K. Watson, Jr.,** landman in the Tyler producing district, has been promoted to assistant district manager of the new district. Winbery succeeds the late **Preston Fergus** as manager of Tyler's district.

Winbery joined a predecessor company of United Gas in 1923. In 1938, he was named United Gas Pipe Line Company's Southwest Louisiana district manager. In 1947, he was transferred to Dallas. Watson has been with the company since 1940, and became landman in Tyler in 1948.

United Gas Pipe Line Company has elected **Max P. Watson** a member of the board of directors. Watson is a 23 year veteran with the United Gas organization and is assistant to the president of United Gas Corporation, United Gas Pipe Line and Union Producing Company.

Watson joined United Gas in 1937. He worked in Engineering departments for five years and became manager of gas purchases in the gas Supply Department in 1959. He was named assistant to the president in 1959.

William S. Davidson, Jr., has been named manager of **Tidewater Oil Company's** eastern division Transportation Department. He succeeds **Allen L. Piper,** who was recently transferred to the western division.

Davidson, formerly general superintendent of Tidewater's western division Pipe Line Department, joined the company in 1922. He became general superintendent of the Pipe Line Department in 1956.

Norman V. Kinsey, Jr. has been elected a director of **Transcontinental Gas Pipe Line Corporation.** He succeeds his father, the late **Norman V. Kinsey,** who was a member of the original board of directors.

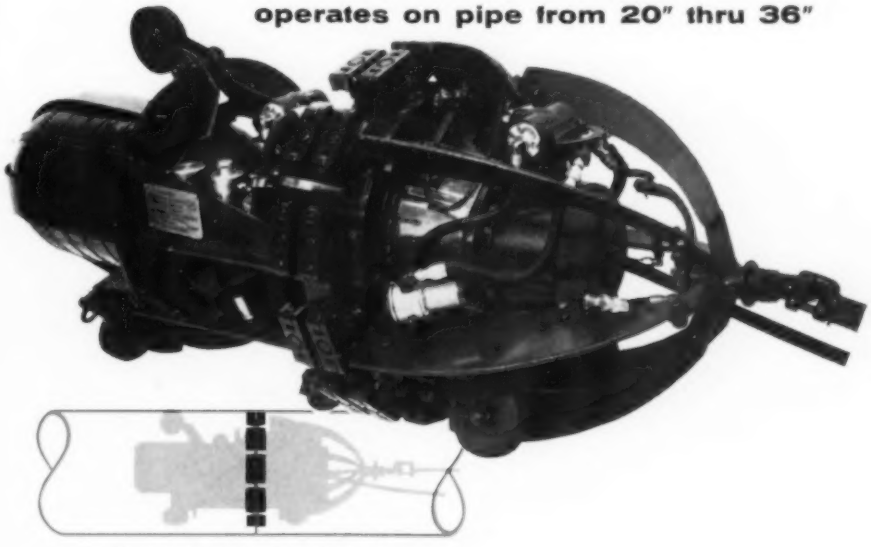
N. V. Kinsey, Jr.

Kinsey has been associated with his father in the firm of Kinsey and Kinsey in all phases of oil, gas, and pipe line business. He also has been active in the formation and building of Transco, Texas Illinois Natural Gas Pipe Line and Pacific Northwest Gas Pipe Line.

COMPLETELY NEW

*C-R-C AIR CLAMP**

operates on pipe from 20" thru 36"



THE LINE-UP CLAMP

THAT DOES NOT DAMAGE OR SCRATCH PIPE

CHECK THESE FEATURES:

- Rollers roll pipe into perfect round without friction or sliding of clamp.
- Pneumatically controlled heads operate independently for quick, positive line-up.
- COMPLETELY DEPENDABLE. All working parts completely enclosed, and made from aircraft quality steels for the lowest possible maintenance.

* *Patent applied for.*

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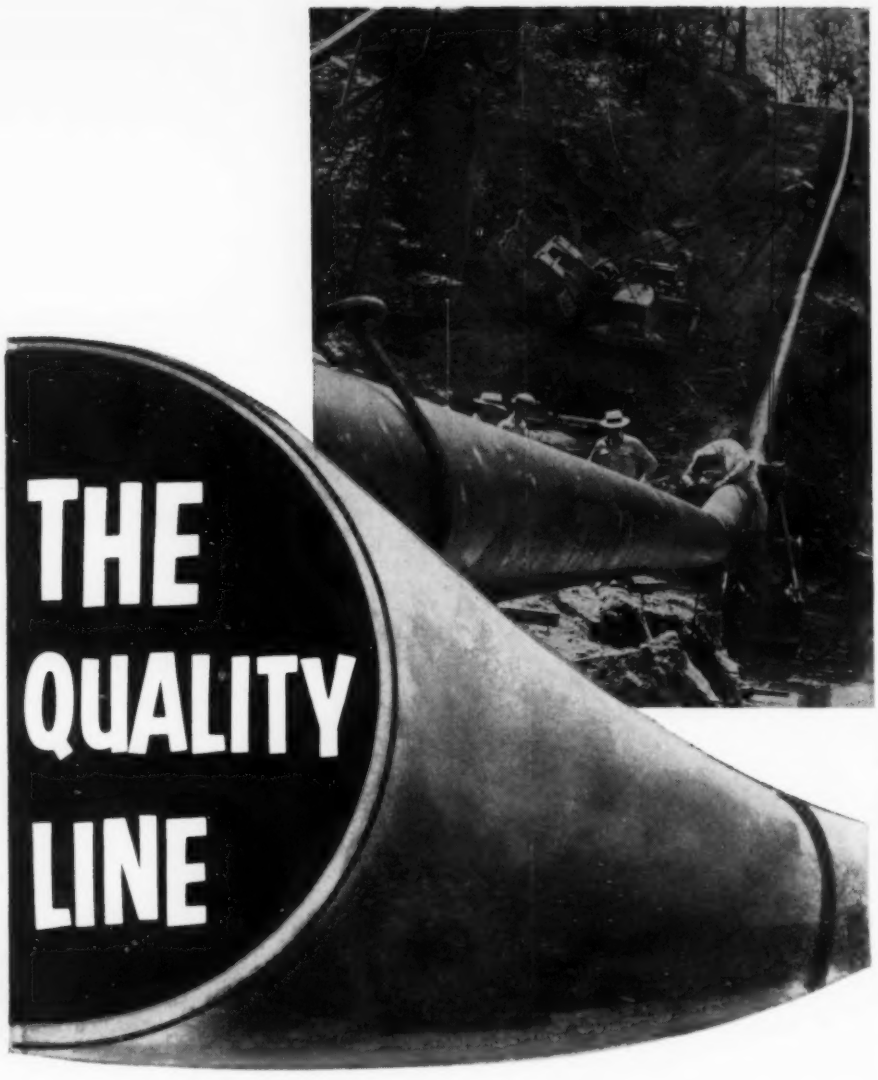

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REMEMBER, LATEX QUALITY BRINGS REPEAT BUSINESS "AGAIN AND AGAIN"

Another quality service of *LATEX* is CONSTRUCTION OF PEAK SHAVING PLANTS. Pictured here is Atlanta Gas Light Company's Riverdale peak shaving plant near Atlanta.

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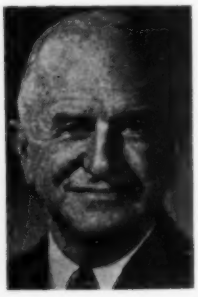
The National Defense Transportation Association has announced that **Stephen D. Bechtel, Sr.,** chairman of the board and president of **Bechtel Corporation,** has been chosen by the Joint Chiefs of Staff to receive the eleventh annual National Transportation Award. The honor is bestowed on the person "whose achievement contributed most to the effectiveness of the transportation industry in support of national security."



S. D. Bechtel, Sr.

The award will be presented to Bechtel at the association's annual meeting in New Orleans, October 2-5, by the Honorable Perkins McGuire, assistant of Defense for Supply and Logistics.

The military-civilian association established the award in the interest of promoting preparedness and fostering a keener realization of military transportation requirements. **Robert G. LeTourneau** was the 1959 recipient.

Through service in engineering and construction, Bechtel has spent 40 productive years in strengthening transportation facilities. The Bechtel Corporation started in railroad construction 60 years ago. The organization has built bridges, highways and tunnels and has been responsible for the engineering and construction or management of some of the world's principal oil and gas pipe line systems.

In addition to being chairman and president of Bechtel Corporation, Bechtel is on the board of directors of Pacific Gas Transmission Company, Southern Pacific Company and United States Lines Company. In 1954-55, he served on President Eisenhower's five-man advisory committee on a National Highway Program.

Frederick G. Wilmot has been appointed to the position of manager, contract development for **Mannix Co., Ltd.** Wilmot will specialize particularly in the area of the petroleum industry where he has had broad experience, most recently as Western Canadian manager for Taylor Forge & Pipe Works of Hamilton.

James H. Gill has been appointed Louisiana State's next conservation commissioner. He will succeed **Ashton Mouton** who held tne post under Former Gov. Earl Long.

Gill is secretary of the Baton Rouge Industrial Contractors Association.

L. T. Potter, president of **Lone Star Gas Co.,** has been nominated for president of the American Gas Association. Elections will be conducted at the AGA annual convention in Atlantic City, October 12. Currently vice president of the association, Potter is among 31 executives from pipe line, utility and manufacturer member companies nominated to serve as officers, directors and chairmen for 1961.

Charles H. Mann, treasurer, **The Columbia Gas System, Inc.,** has been nominated as treasurer. **Wister H. Ligon,** president of the AGA, automatically begins a one-year term as a member of the board when his present term expires.

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OVER 3 THROUGH 2000 HP

ranges our production – programm comprising a suitable Diesel for every application. Even for Oil-Boring and High – Pressure Pipe-Line Pumping there are highly efficient, reliable, economic units in our catalogue.

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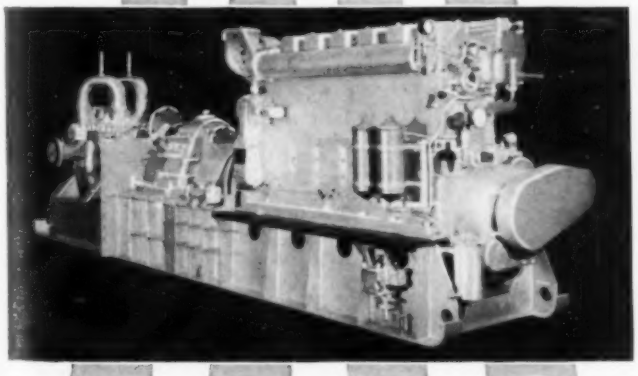
Explosion proof, consisting of four-stroke MWM-Diesel-Engine, Type TRHS 526 S, 375 HP at 1000 RPM and KSB-Pump, Type GPL-100, four-stage. Delivery: 120 m³/hr at 84 atm. gauge.



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Just one application controls weeds and brush for 8 to 18 months!

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Available in 2 easy-to-use forms! *Liquid* UROX Weed Killer is ideal for spraying large overgrown areas. Won't clog spray nozzles or strainers. Does not precipitate out in the tank. Stays in solution perfectly. *Granular* UROX is the convenient, inexpensive way to treat small weed-infested areas. Can be applied quickly and easily with any mechanical or hand-operated spreader.

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The new Brushking Model 660 — now 50% more powerful with 3 H.P. *throughout* — keeps lines clear . . . keeps maintenance costs down. Slashes through brush and trees up to 9" dia. Trims overhead or reaches into ditches. Cuts close to posts, fences, walls. With grass trimming attachment, clears heavy grass and weeds. Guaranteed shatterproof blade — complete operator safety.

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THE DRINKING PROBLEM
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By C. A. D'Alonzo, M.D., F.A.C.P.

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This book deals not only with alcoholism generally, but also with its effects, care and treatment when encountered on the job. It provides answers to many important questions such as: What is alcoholism? What is industry's role in the problem of alcoholism? What are the community problems related to alcoholism? What are the major signs that indicate existence of a drinking problem? What is the treatment? Is there a cure?

The author is assistant medical director of E. I. Du Pont de Nemours and Co., Inc. Du Pont is well known for its efforts to rehabilitate the alcoholic worker.

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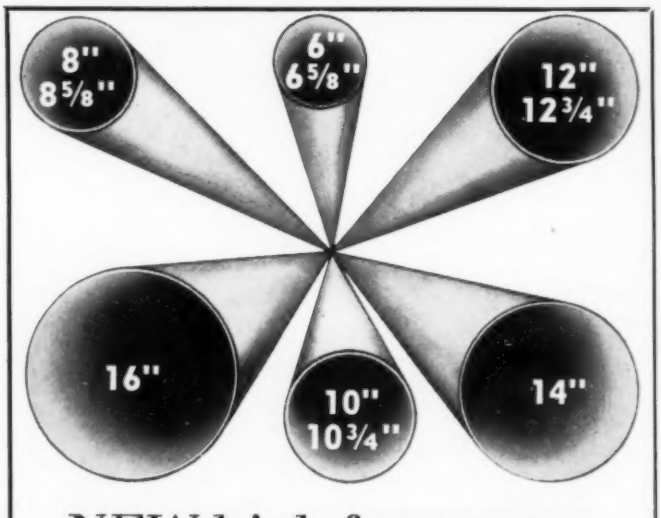

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If you want a closer source for pipe that meets the highest standards of the industry, better talk to Valley. New resistance welding and process control facilities assure you of the quality you demand. Ideal as line pipe for petroleum, gas, water, etc. Surface casing also available. Special wrappings and coatings.

Sizes: 6" 6⅝" 8" 8⅝" 10" 10¾" 12" 12¾" 14" 16" in wall thicknesses to .219.

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VALLEY MANUFACTURING COMPANY
VALLEY, NEBRASKA

James W. Hargrove, financial vice president and secretary of Texas Eastern Transmission Corporation, has been named to the William Marsh Rice University Board of Governors. **John D. Simpson** was named along with Hargrove to replace **Herbert Allen** and **Malcolm Lovett** who become governor advisors.

James W. Hargrove

Hargrove was a Phi Beta Kappa when he was graduated from Rice in 1943. Hargrove joined Texas Eastern in 1947, and in 1948 was named assistant secretary and assistant treasurer. In 1954, he was named vice president and secretary of the company and in 1958, became financial vice president and secretary.

John Blight has been appointed treasurer of **Interprovincial Pipe Line Company.** He succeeds **D. G. Waldon** who was appointed assistant general manager in 1959. He will headquarter in Toronto, Ont. Blight has been with the company since 1950. Previously he was with **Andian National Corporation** in South America. Blight had been chief accountant of Interprovincial.

Other changes in Interprovincial management personnel have been announced. **W. S. Gibson** becomes superintendent of district 5 of Interprovincial. He had been district engineer of district 2 in Regina, Saskatchewan. **J. E. Letson,** formerly superintendent of district 5, becomes superintendent of district 2 with headquarters in Regina. **O. T. Linton,** formerly superintendent of district 2, will be transferred to Toronto to become management assistant in the executive offices of the company. **A. B. Jones,** formerly management assistant in Toronto, becomes coordinator, Planning and Economics Department in the head office in Edmonton. **P. H. Buckland,** formerly coordinator of planning and economics in Edmonton, assumes new duties as assistant district superintendent of district 4.

John Blight

Glenn W. Holcomb has been named the official nominee for president of the **American Society of Civil Engineers** for 1960-61. Nomination of Holcomb, chairman of the department of civil engineering at Oregon State College, was decided at a meeting of the Society's board of directors at its Reno convention.

The new president will replace **Frank A. Marston** and will take office at the October convention of the ASCE in Boston. Holcomb has served as a director and vice president of the society, of which he became an associate member in 1928. He has been on the staff at Oregon since 1920, advancing from instructor in civil engineering to head of the department.

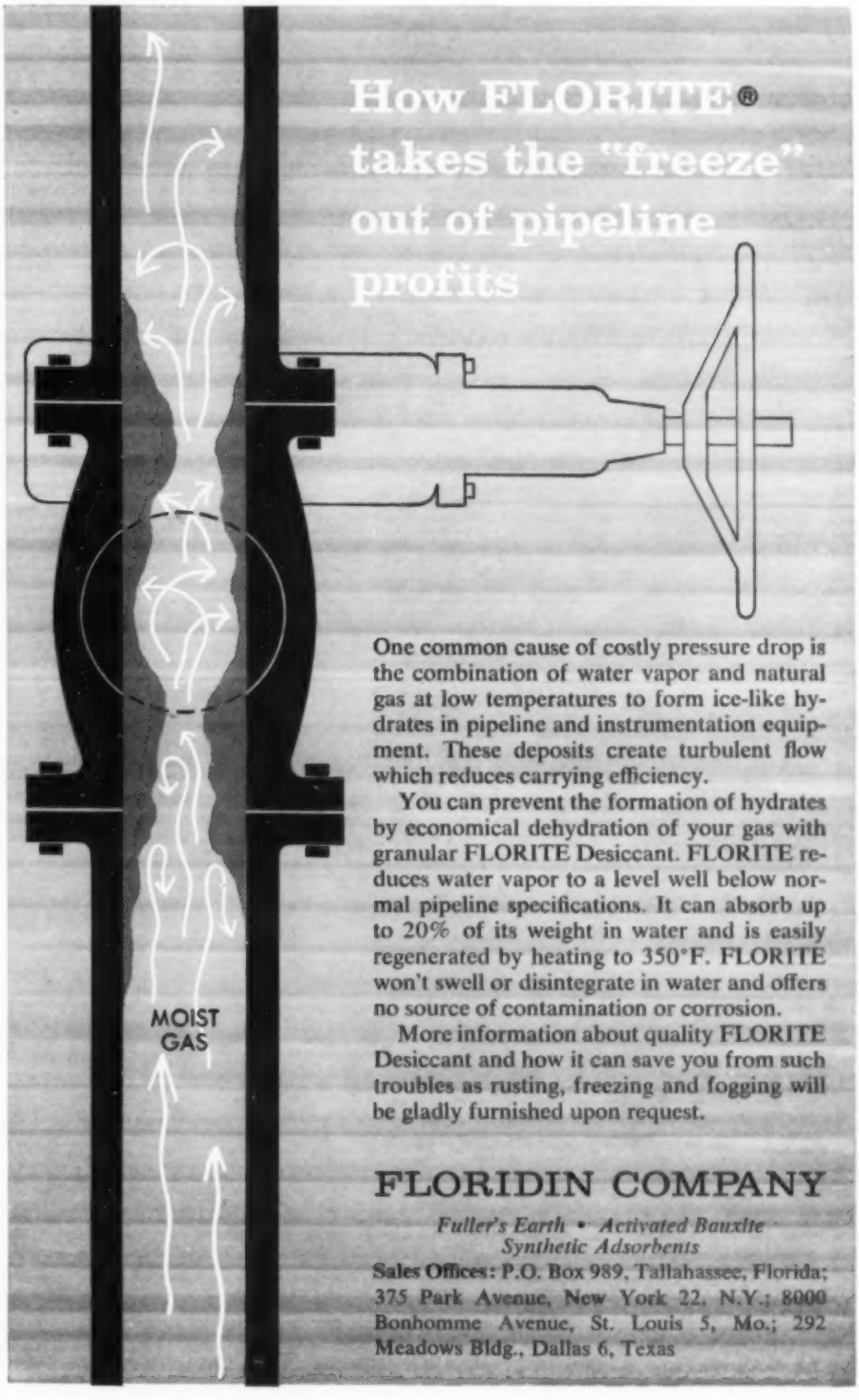
Daniel B. Lovejoy, senior vice president of **Union Texas Natural Gas Corporation,** has been elected a director of the company. Lovejoy is in charge of all financial affairs of the corporation. He joined the company in 1938.

The Houston Corporation announces the appointments of **J. French Robinson** and **John M. Harbert, III,** as members of the board of directors.

Robinson was president and a director of **Consolidated Natural Gas Co.** from 1943 to 1951, and was chairman of the board until his retirement in 1955. He is presently an executive consultant to Republic Steel Corporation. Harbert was a member of the original planners of the Texas to Florida line. He is president of Harbert and Cargil, Inc., and Harbert Construction Corp., and vice president of Mill Ridge Coal Co.

H. B. Brown has been named an administrative vice president of **Gulf Oil Corporation** and appointed coordinator—transportation, responsible for the coordination of all methods to transport crude and products.

He succeeds **R. D. McGranahan,** who recently resigned to become president of **Wilshire Oil Company.** Brown joined Gulf in 1950 as a member of the Executive Department, where he was concerned primarily with marine matters. He was named general coordinator, Transportation Department in 1958. His office will be in Pittsburgh.



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For more data on advertised products, use Readers' Service Cards, last page.

The Triangle Construction Company has been formed for pipe line and general oil field construction work. The company, headed by president **Charles F. Sarratt**, will be active in Oklahoma, Kansas, Arkansas and the Texas Panhandle.

Charles F. Sarratt

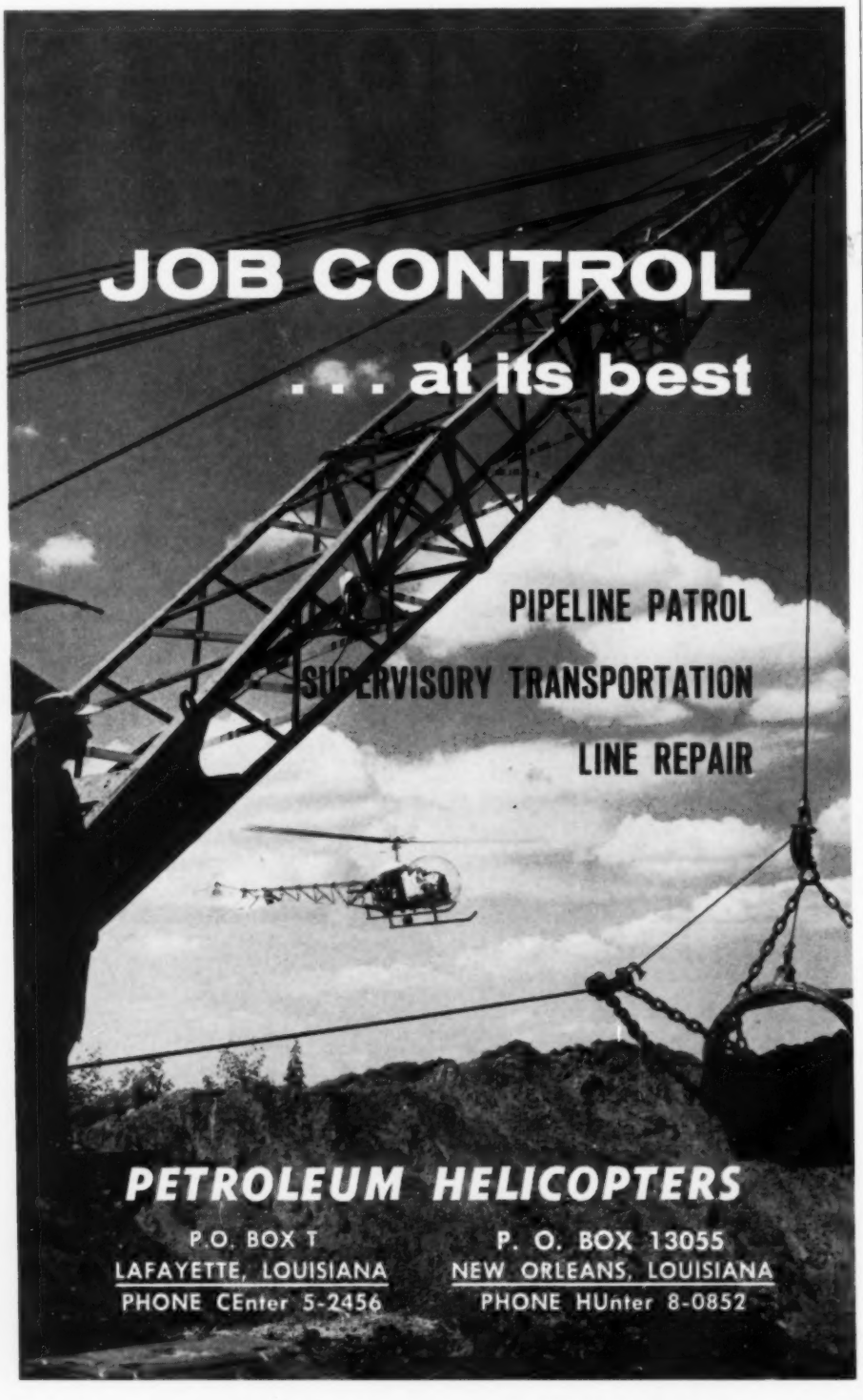
Jack Hammer has been named vice president in charge of operations for Triangle Construction. Hammer is former manager of the Lindsay Rig Department of Fox Rig and Lumber Company where he had been employed for 13 years. General offices of the company are in the Commerce Exchange Building, Oklahoma City. Field operations office is located in Lindsay, Okla.

Deaths

R. Paul Huggins, 67, former vice president and director of the Gulf Oil Company, died Aug 9 in his home in Houston. Huggins joined Gulf in 1921, and retired in 1958. He had been in charge of pipe line and crude oil purchasing.

•

Norman T. Shideler, corrosion consultant, died July 14. He had been associated with Pittsburgh Coke & Chemical Company. An author of several trade and technical articles, Shideler had been a member of the NACE, AGA, American Water Works Association and the American Chemical Society.



WHO'S MEETING WHERE

September

ASME, joint automatic control conference, Massachusetts Institute of Technology, Cambridge, Mass., September 7-9.

NGAA, Rocky Mountain Regional Meeting, Palliser Hotel, Calgary, Alb., September 15.

ASME-AIEE, power conference, Bellevue-Stratford Hotel, Philadelphia, Pa., September 15-16.

ASME, petroleum division meeting, Jung Hotel, New Orleans, Sept. 18-21.

Texas Mid-Continent Oil & Gas Association, forty-first annual meeting, Hilton Hotel, San Antonio, Texas, September 19-21.

Pacific Coast Gas Association, annual convention, Westward Ho Hotel, Phoenix, Ariz., September 21-23.

Southeastern Gas Association, annual meeting, Sir Walter Hotel, Raleigh, N. C., September 21-23.

AIEE, electrical conference of petroleum industry, Hotel Skirvin, Oklahoma City, Sept. 25-28.

American Welding Society, national fall meeting. Hotel Penn-Sheraton, Pittsburgh, Pa., September 26-29.

Instrument Society of America, 15th annual meeting, New York City, September 26-30.

Mid-West Gas Association, annual conference, Iowa State College, Ames Iowa, September 27-29.

NACE, central Oklahoma section short course, University of Oklahoma, Norman, Okla., September 28-30.

October

INGAA, annual meeting, Fontainebleau Hotel, Miami Beach, Fla., Oct. 3-4.

Gas Measurement Institute, National Guard Armory, Liberal, Kan., October 4-5.

NACE, 10th annual Western Region Conference, Sheraton-Palace Hotel, San Francisco, October 6-7.

NACE, Southeast Region Conference, Dinkler-Plaza Hotel, Atlanta, Ga., October 6-8.

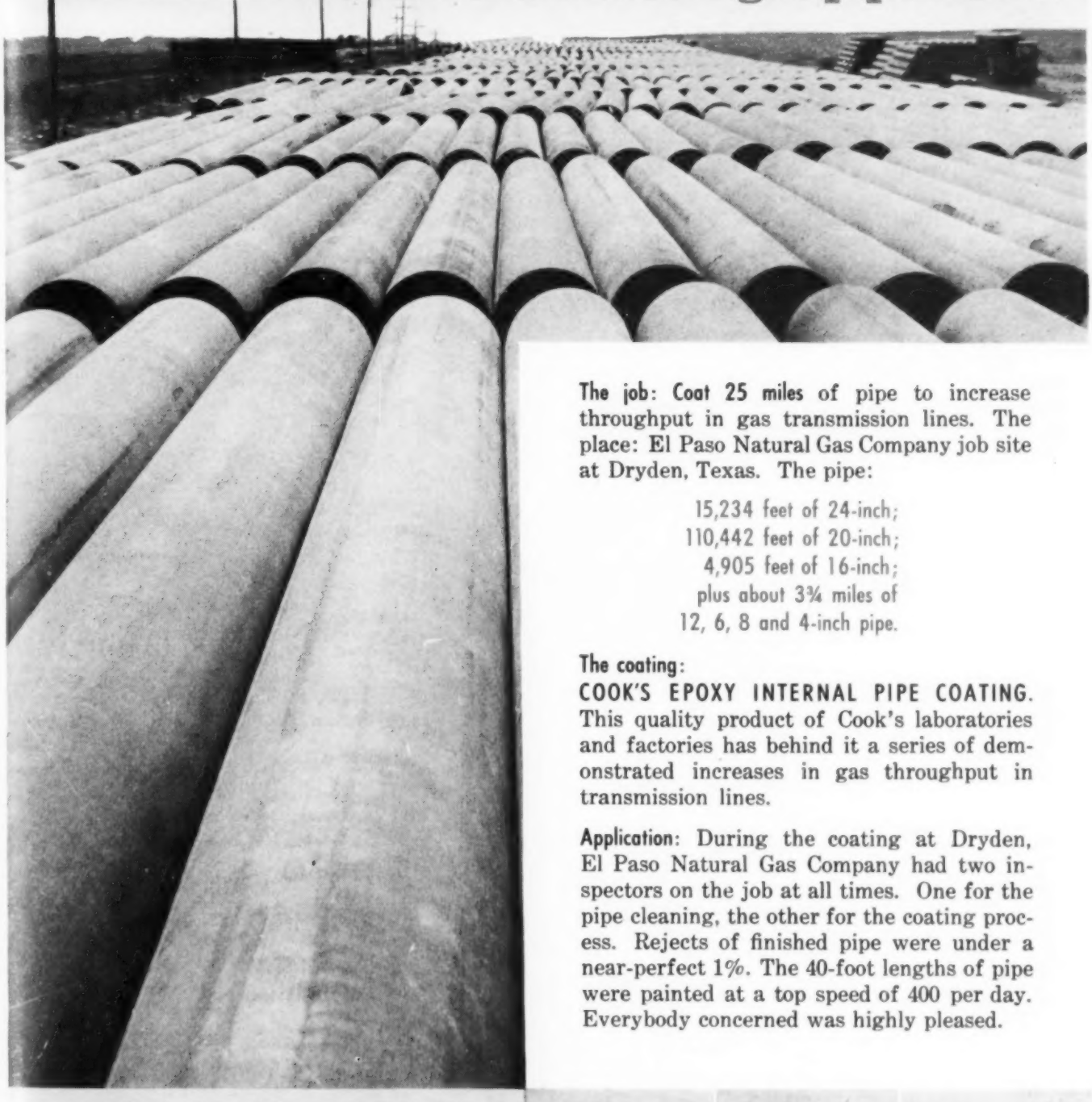
AGA, annual convention, Atlantic City, N. J., October 10-12.

NACE, Northeast Region Conference, Prichard Hotel, Huntington, W. Va., Oct. 11-14.

California Natural Gasoline Association, fall meeting, Hotel Miramar, Santa Monica, Calif., 13-14.

ASME-ASLE, lubrication conference, Statler Hilton, Boston, October 17-19.

Why Cook's epoxy internal pipe coating system was selected for another natural gas pipe line...



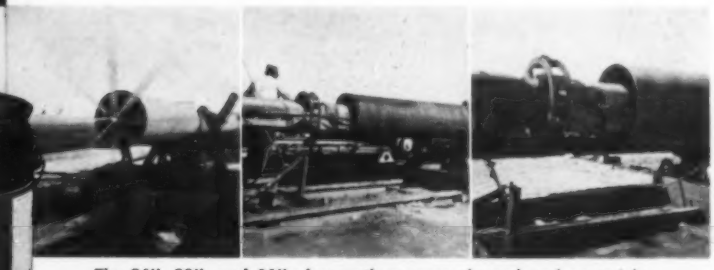
The job: Coat 25 miles of pipe to increase throughput in gas transmission lines. The place: El Paso Natural Gas Company job site at Dryden, Texas. The pipe:

15,234 feet of 24-inch;
110,442 feet of 20-inch;
4,905 feet of 16-inch;
plus about 3¾ miles of
12, 6, 8 and 4-inch pipe.

The coating:
COOK'S EPOXY INTERNAL PIPE COATING. This quality product of Cook's laboratories and factories has behind it a series of demonstrated increases in gas throughput in transmission lines.

Application: During the coating at Dryden, El Paso Natural Gas Company had two inspectors on the job at all times. One for the pipe cleaning, the other for the coating process. Rejects of finished pipe were under a near-perfect 1%. The 40-foot lengths of pipe were painted at a top speed of 400 per day. Everybody concerned was highly pleased.

YOU, TOO, may have coating problems of various kinds. Look to Cook's for the job-prescribed coating that's just right. And get the experienced help of our coating engineers and chemists. They'll analyze your need, provide specific product data sheets and prepare specifications for you or your contractor. Just write, wire or phone.



The 24", 20", and 16" pipe sections were cleaned and coated by the Texas Pipe Coating Co., Inc., of Odessa, Texas, using Crose Perrault machines, shown in action above. Smaller size pipe was done by sandblasting and coating with a 360° spray gun.

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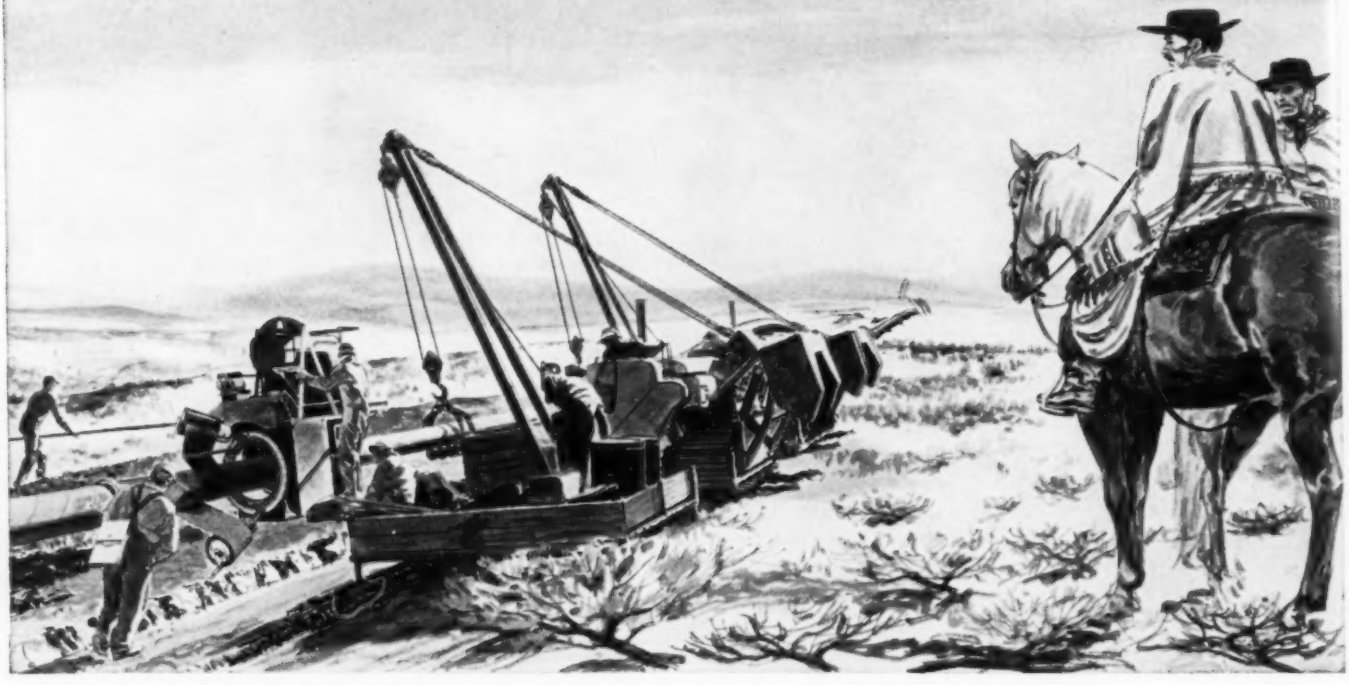
For more data on advertised products, use Readers' Service Cards, last page.

"They engineered this oil line to a cat's whisker"—then wrapped it with Polyken tape



One of the world's largest pipeline operators chooses the world's toughest tape coating for new Patagonian oil line

A leading international pipeline company recently wrapped over 100 miles of crude oil gathering and transmission line with Polyken No. 960 Extra-Strength Pipeline Roll.

The new line, which crosses part of the Patagonian plateau of southern Argentina, is an example of perfection in pipeline design. "They engineered it to a cat's whisker," is the way a seasoned pipeliner put it.

In their construction plans, the engineers specifically called for Polyken No. 960 Tape. Seven years of testing and study had convinced these people that Polyken delivers the durable, practical protection that a precision-built line needs.

There's a lot more to be said for Polyken tape. See your Polyken representative, or call the Polyken tape coating distributor nearest you. Or simply write Polyken, 309 West Jackson Blvd., Chicago 6, Ill.

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Using tensioned-spindle equipment, pipe is cleaned and wrapped in one factory-smooth operation. Polyken tape is ready. No primer, no drying or cooling. No fumes or fire hazard.

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Seattle, Washington
Pacific Water Works Supply Co.

St. Louis, Missouri
Shutt Process Equipment Co.

Tulsa, Oklahoma
Midwestern Pipe Line Products Co.

Polyken

Experienced in modern PROTECTIVE COATINGS

NACE, North Central Region Conference, Pfister Hotel, Milwaukee, October 19-20.

Independent Petroleum Association, annual meeting, Statler Hilton Hotel, Dallas, Texas, October 23-25.

NACE, South Central Region Conference, Mayo Hotel, Tulsa, October 25-27.

NGAA, Southern Regional Meeting, Carlton Hotel, Tyler, Texas, October 28.

November

NACE, Canadian Region Eastern meeting, Sheraton Mount Royal Hotel, Montreal, Quebec, November 14-16.

API, annual meeting, Palmer House Conrad Hilton and Congress Hotels, Chicago, November 14-16

Natural Gas Pipeline Institute, court room, Court House, Liberal, Kan., November 15-16.

NGAA, Panhandle Plains Regional meeting, Herring Hotel, Amarillo, Texas, November 18.

ASME, winter annual meeting, Statler Hilton, New York, November 27, December 2.

January

Pipe Line Contractors Association, annual meeting, Fairmont and Mark Hopkins Hotels, San Francisco, January 15-18.

NGAA, Gulf Coast Regional meeting, Robert Driscoll Hotel, Corpus Christi, Texas, January 20.

March

ASME, Gas Turbine Power Division, cosponsored by the Department of Defense, sixth annual conference and exhibit, Shoreham Hotel, Washington, D. C., March 5-9.

NACE, seventeenth annual conference, Hotel Statler, Buffalo, N. Y., March 13-17.

New England Gas Association, annual meeting, Hotel Statler, Boston, March 15-17.

Mid-West Gas Association, annual meeting, Sheraton-Fontenelle Hotel, Omaha, Neb., March 27-29.

April

PIEA-PESA, annual meeting, Galveston, Texas, April 11-13.

Southern Gas Association, annual convention, New Orleans, April 24-26.

API, Division of Transportation, annual meeting, Chase Park Plaza Hotel, St. Louis, Mo., April 26-28.

May

AGA, Transmission Section, annual meeting, Brown Palace, Denver, May 25-26.

SAFE-SURE
Liquid Level Control by
LEVEL MASTER®

Here's your supply source for a complete line of standard and custom controls. Pictured is one of our Chamber Controls—an example of our broad line of standard units. We also specialize in custom controls of all types. The long-lasting magnetic proximity switch, incorporating a permanent Alnico V magnet, responds instantly to changes in liquid level.

- *Models for all types of liquids.*
- *Horizontal, vertical, external mountings.*
- *Precision engineered for long life operation.*

For full information consult your Level Master representative or write directly to:

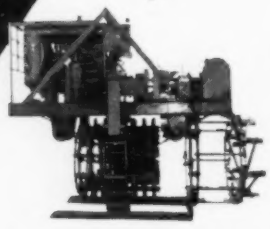
Jo-Bell Products, Inc.
5456 W. 111th St. • Oak Lawn, Ill. • Phone GArden 5-0240

Jo-Bell Products, Inc.
5456 W. 111th St., Oak Lawn, Ill.
Send full information on Level Master and name of nearest representative.

My name_____
Company_____
Address_____
City_____ Zone_____ State_____

MYOCO

CLEANING and PRIMING MACHINES

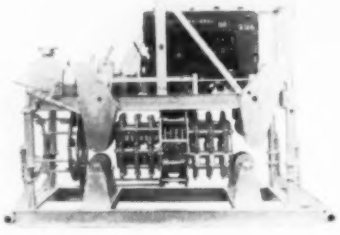


MYOCO MODEL "DR"

Especially designed MYOCO Counter Rotating Heads on this cleaning and priming machine give double cleaning action to pipe.

Seam welds are cleaned thoroughly on both sides.

This fast, dependable unit is powered by an International U-9 self-starting engine using the Ramsey transmission. Engine exhaust is utilized to heat primer tank. Sizes: 3" through 36".



MYOCO CLEANING AND PRIMING MACHINE

Set on a stationary base for yard cleaning this 6-12 Model will clean and prime pipe 3" through 14" diameter plain end.

These machines, like all the equipment at Myoco, can be rented to save you capital, investment and storage costs. Trained, courteous personnel are available 24 hours a day with fast transportation to serve you. Efficient equipment operation is assured by periodical checks. All parts and supplies are shipped the same day, when possible.

Write for our catalog

MORRIS-YOUNG-OWENS CO. PIPELINE EQUIPMENT AND SUPPLIES MYOCO

MORRIS-YOUNG-OWENS CO.

PIPELINE EQUIPMENT AND SUPPLIES

P. O. Box 35137 • Houston 35, Texas

PArkview 3-0110

In Canada: MYOCO LIMITED, Rural Route 1, Midland Ave. N., Agincourt, Ontario, Canada Tel. WA 2-9444

What's Happening among SERVICE and SUPPLY MEN

Triple-Eye Company Officers

Officers of the newly formed International Inspection, Inc.,—Triple Eye—look over new brochure describing the company's service. Triple Eye, a subsidiary of Welex, Inc., will specialize in ultrasonic inspection of tubular goods for corrosion. Officers, from left to right, include H. K. McArthur, executive vice president; J. Randolph Richards, president; Roy O. Shaffer, chairman of the board, and T. G. Bogle, vice president, sales and advertising. The company has offices in Houston, Fort Worth and Pasadena, Calif.

SIE Appoints Col. Kaiser Manager Planning Programs

Col. George B. Kaiser, USAF (retired) has been appointed manager, planning programs under Robert O. Vaughan, vice president of marketing at Southwestern Industrial Electronics. Kaiser has had extensive military electronics background and worked 10 years in the industry. His last duty prior to retirement this year was as the staff systems management engineer at headquarters air research and development command at Wright-Patterson Air Force Base, Ohio.

Oil and Gas Supply Company Named Turbine Representative

The Oil and Gas Supply Company has been named a gas and petroleum industry representative for certain gas turbine and turbomachinery lines of AiResearch Manufacturing Division, Garrett Corporation. Initial market analysis and technical advice in adaptation of small turbines to gas gathering applications is included in the agreement. Also covered is marketing and packaging of off-the-shelf and special design turbine equipment as well as warehouse of spare parts.

THE GO-DEVIL — READY TO GO!

Partly compressed guide arms and knives are held tight but flexible against pipe walls by pressure of individual springs. Guide arms keep scraper in line, eliminating undue driver wear and prevents cocking. Flexibility permits Go-Devil to round bends.

Go-Devil

G. A. COTTEN CO. **P. O. Box 5332** **Tulsa, Oklahoma**

Clyde W. Cook

R. Fred Klein

Walworth Company Establishes Lubricated Plug Valve Division

Walworth Company announces formation of a new lubricated plug valve division with headquarters in Houston. Clyde W. Cook, new vice president in charge of lubricated plug valve operations, will be in charge of the new division. R. Fred Klein, assistant vice president of the operation, will be located in New York.

The technical sales force is augmented by a highly mobile fleet which employs aircraft and vehicles for quick valve service. Technical and sales personnel will be located in key cities throughout the country.

Cook joined Walworth's subsidiary, Grove Valve & Regulator Company in 1954, and in 1958, was named Western Division sales manager of Grove. He will direct all sales and service activities through Walworth distributors from headquarters at 3517 Polk Avenue, Houston 23. Klein came to Walworth in 1945, and has been manager of lubricated plug valve sales since 1958.

Delta Tank Manufacturing Co. Names Four Sales Representatives

Delta Tank Manufacturing Co., Inc., has appointed four sales representatives in its Texas and Louisiana territories. George C. Allen will headquarter in Houma, La., in the Eastern Region sales office. Ralph Kemp, Jr., becomes sales representative in the Midland, Texas, area. In the Corpus Christi, Texas, area Winston C. Shook and George H. Barnes have been named representatives.

Prior to joining Delta, Shook had 12 years experience in sales and petroleum equipment business. Barnes was active in sales in Texas and Louisiana before joining the company. Kemp and Allen have been in the equipment sales industry prior to joining Delta.

United States Steel Corp. Names Three Vice Presidents

John E. Angle has been appointed administrative vice president—steel producing divisions of United States Steel Corporation. James W. Kinnear was named vice president—steel producing divisions, and R. C. Colbaugh, Jr., has been named vice president—industrial engineering.

Angle succeeds Oscar Pearson, who was appointed executive vice president of Tennessee Coal and Iron Division. He has been with the company since 1932 when he became a junior metallurgist at the Gary Sheet and Tin Mill.

Colbaugh succeeds Angle in his new position. He has been with the company since 1935. Kinnear has been executive vice president of the Tennessee Coal & Iron Division. He joined the company in 1923 as a laborer at the Homestead District Works.

KA-MO

DOES IT IN ONE OPERATION . . .

Bores Hole, Installs Casing at the Same Time . . .

Here 106' of 24" diameter casing is being installed under a railroad bed as 18 hp air-powered Ka-Mo drill bores hole ahead through compacted clay and ballast. Drilling Time: 4 hours.

Line work that crosses highway, byway and city streets calls for Ka-Mo. With a Ka-Mo drill you can install casing as you bore without fear of costly cave-ins . . . without stopping traffic or cracking pavement . . . no back filling or re-surfacing.

Your Ka-Mo drilling specialist can recommend the right drill for you. He knows his field . . . has helped many cut costs and speed line installation work. Ka-Mo drills available in 2" to 48" sizes, and larger. Powered by air, hydraulic, electric, gasoline or diesel to meet job requirements. Get in touch with your Ka-Mo man or write for Ka-Mo engineering booklet today.

KA MO

KWIK-MIX CO.
Ka-Mo Tools Dept.
Port Washington, Wis.

A Division of KOEHRING *Company*

KAMI-PI

Name _____

Title _____

Company _____

Address _____

City _____ Zone _____ State _____

For more data on advertised products, use Readers' Service Cards, last page.

The Hallmark of Quality Coating and Wrapping

Standard Pipeprotection Inc. uses the same care in coating and wrapping your pipe that quality jewelers use in carefully matching their finest strands of expensive pearls.

SPI's Standard Procedures establish the highest standard of quality for pipe protection. Our hallmark on the kraft wrapper of your pipe assures you of the best.

standard pipeprotection inc.

3000 SOUTH BRENTWOOD BLVD. • ST. LOUIS 17, MISSOURI

Youngstown Names W. L. Scott, Jr. Seamless Tube Mill Superintendent

Walter L. Scott, Jr., has been appointed superintendent of the Youngstown Sheet and Tube Company's No. 3 seamless tube mill at Indiana Harbor Works. Since 1957 he has been assistant superintendent of the mill. He has been with the company since 1949 when he was appointed an industrial engineer.

Raymond L. Crowe succeeds Scott as assistant superintendent. Crowe came to Youngstown earlier this year. Formerly he was foreman for Mannesmann Tube Company, Ontario.

C. L. McDougall

O. W. Stanley

Cooper-Bessemer Corporation Makes Four Sales Appointments

C. L. McDougall has been named assistant parts sales manager of the Cooper-Bessemer Corporation. O. W. Stanley has been named branch manager of the Odessa, Texas, office where he will direct sales and service activities in West Texas area. Harvey B. Cox, Jr., becomes sales engineer in Houston, and William F. Heavey was made sales engineer in Washington.

McDougall joined the company in 1950, and was named Odessa branch manager in 1957. Stanley has been a sales engineer in Houston and he replaces McDougall at Odessa. Prior to joining the company, Heavey had been a manufacturer's representative in Pittsburgh, Pa. Cox formerly was associated with Clark Brothers Company in Houston.

Electro-Mechanical Research Opens Houston District Office

Electro-Mechanical Research, Inc., has established a new district office in Houston. The office will provide sales and service for the company's comprehensive line of industrial products.

Maurice C. Superville, formerly sales engineer in the Houston area for Vapor Recovery System Company, will manager the office. Superville's prior experience also includes positions as sales engineer with the General Electric Company and Southern Engine and Pump Company. New office is located at 112 Meyerland Plaza Mall, Houston 35.

Albert & Harlow, Inc., Becomes Bucyrus-Erie Oklahoma Distributor

Albert & Harlow, Inc., of Tulsa and Ada, Okla., has been appointed a distributor for Bucyrus-Erie crane-excavators in eastern Oklahoma. The new distributor offers sales and service on all Bucyrus-Erie convertible crane-excavators; dragline buckets and transit machines. Territory covers that portion of state east of and including the counties of Osage, Pawnee, Payne, Creek, Okfuskee, Seminole, Pontotoc, Johnston and Marshall.

Young Radiator Co. Selects Alaback Sales Representative

Lloyd A. Alaback has been named sales representative for the Young Radiator Company. He heads the thermal engineering company. He has been associated with the heat transfer industry for several years.

Alaback will promote sales of Young jacket water coolers, evaporative coolers and HC air cooled coolers and condensers in the Tulsa area.

"Made-in-U.S.A." Tag Denotes Tube Turns Division's Products

Tube Turns Division of Chemetron Corporation is adding a red-white-and-blue shipping tag bearing the shield and inscription "Made in U.S.A."

Purpose is to point out clear identification of country of origin in its welding fittings to help distributors and customers guard against the purchase of so-called "question-mark" merchandise.

Chain Belt Company Promotes G. H. Pfeifer

G. H. Pfeifer has been named director of product merchandising and public relations for Chain Belt Company. Other changes include promotion of Robert F. Olsen to sales promotion manager of the industrial section, and Jack Heaps as sales promotion manager of the construction machinery section.

Pfeifer joined the company in 1933, was appointed advertising manager in 1943, and manager of sales promotion and advertising in 1955. Olsen has been with Chain Belt since 1948, and was appointed supervisor of industrial section advertising in 1958. Heaps joined the firm in 1948, and became assistant sales promotion manager of construction machinery section in 1956.

Midwest Piping Elects Baird Member of the Board of Directors

Hugh W. Baird has been named to the board of directors of Midwest Piping Company, Inc. Baird is president and board member of Standard Pipe Protection, Inc., of which he was one of the founders in 1948.

Formerly he had been manager of the pipe line sales for National Tube Division of U.S. Steel.

E. R. Phillips Appointed Rocky Mountain Region Manager

E. R. Phillips has been appointed Rocky Mountain Region manager of Bethlehem Steel Company, Supply Division, with headquarters in Denver.

Phillips joined the company at the Salem, Ill., store and later was transferred to Grayville, Ill., as store manager. He became assistant to the regional manager for the Southwestern Region in 1960.

Lawrence H. Stanley Named To ACF Industries Marketing Post

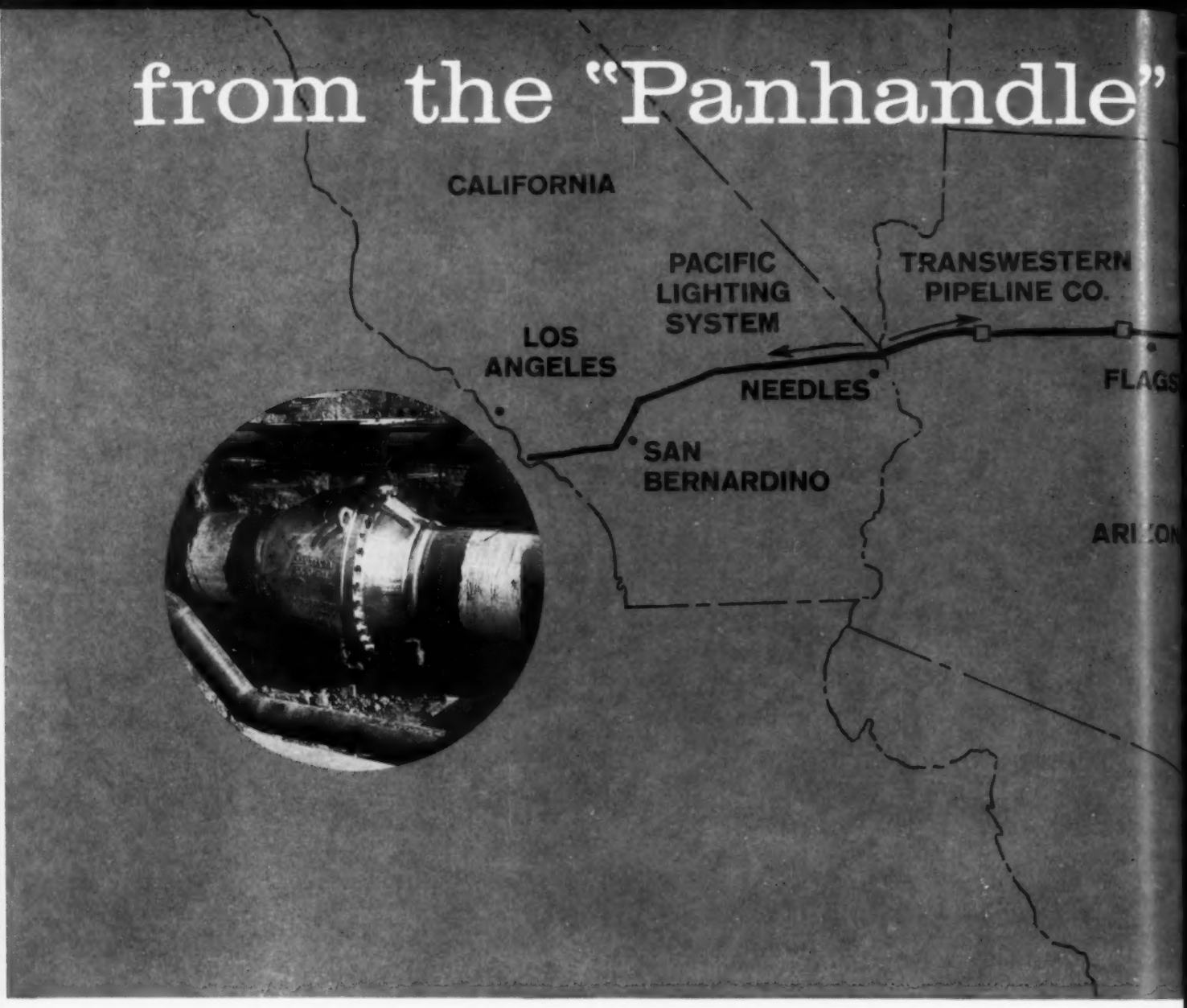
Lawrence H. Stanley has been appointed manager of marketing services for ACF Industries, Incorporated. Stanley, an industrial marketing consultant for the past five years, was co-founder and executive vice president of Case-Stanley Marketing Consultants, Inc.

In his new post, he will participate in the development and coordination of marketing activities of ACF's six operating divisions.

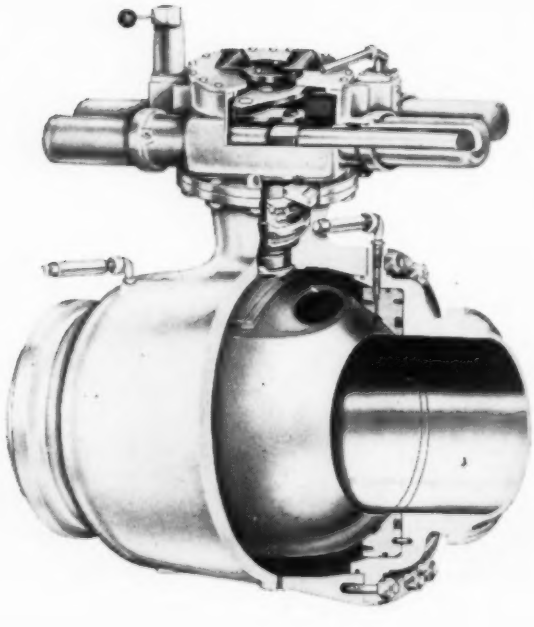
World's Biggest
Proven Reserves...
of natural gas CONSUMERS!
Long the Number One metropolitan area of the nation, the New York-Newark area just keeps on getting bigger, assuring a ready market for your production via Transco, the pipeline to the market where the most people are.
TRANSCONTINENTAL
GAS PIPE LINE CORPORATION

For more data on advertised products, use Readers' Service Cards, last page.

from the "Panhandle"



Modern ROCKWELL HYPRESPHERE

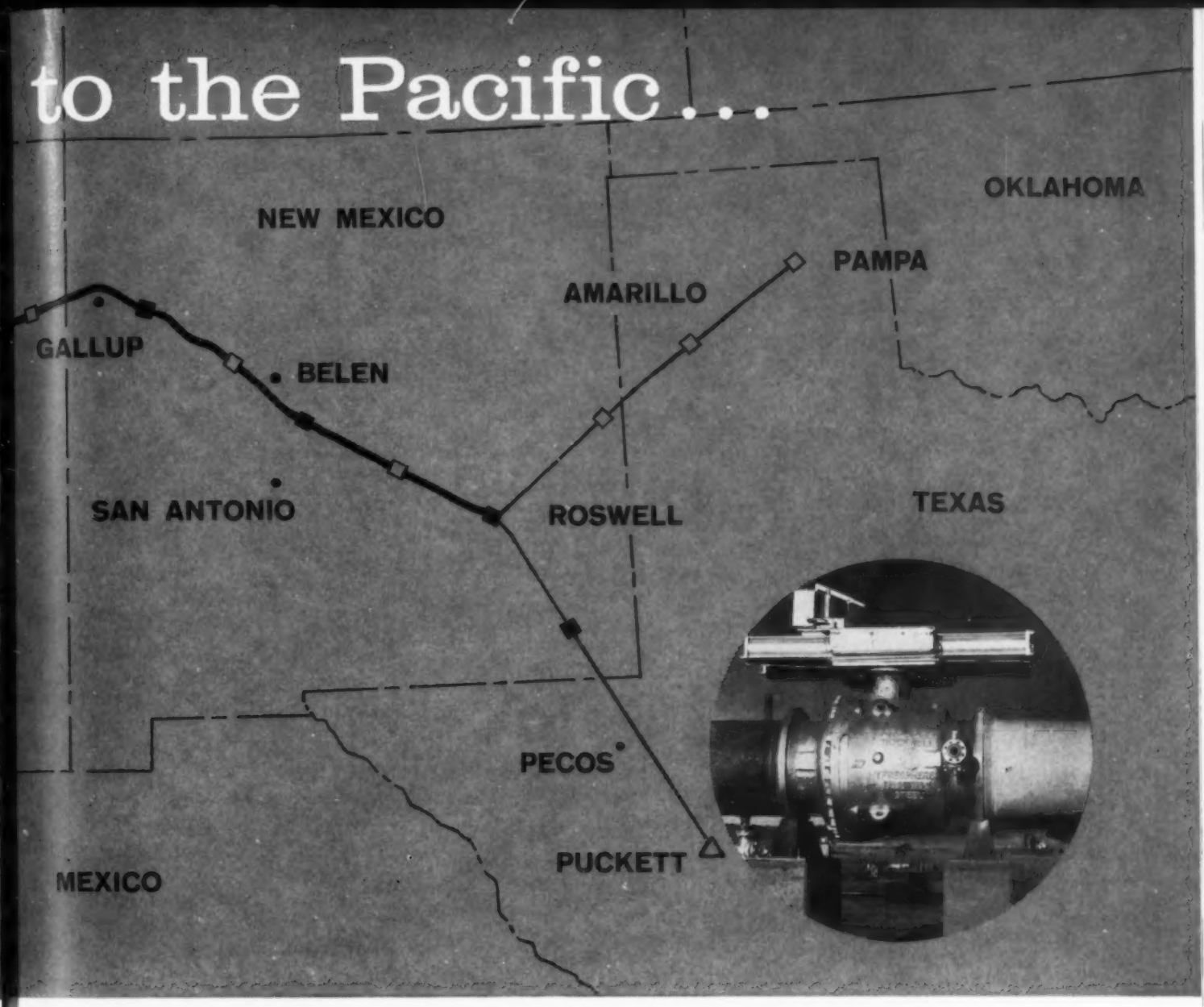


The new gas transmission network shown above brings an initial capacity of 300 MMcfd to help fill the ever-increasing demand of dynamic Southern California for natural gas. This modern network, stretching across four states, will be operated by Transwestern Pipeline Co. and Pacific Lighting System. The pipeline system uses the latest advances in telemetering and remote control techniques for simplified, efficient operation and supervision.

With advanced thinking applied to every phase of the system's design, it was logical that Rockwell Hypresphere valves should have been chosen for 24″, 30″, 34″ and 36″ main line valve services—for these lubricated plug valves are the most modern pipeline valves ever designed.

Compact and bi-directional, Rockwell Hy-

to the Pacific...



VALVES used for main line service

presphere valves require only a quarter-turn to open or close. And, since they are of the famed Rockwell *lubricated* plug design, they are turned quickly and easily by power operators, making remote control operation fast and sure. Rockwell Hypresphere valves provide tight shut-off too, and are self-adjusting, requiring less maintenance. In addition, the full-round opening of the Hypresphere makes it ideal where on-stream pigging is planned—as it was on this "Panhandle to Pacific" system.

For more information on these outstanding valves for pipeline service, write Rockwell Manufacturing Company, Dept. 99-J, Pittsburgh 8, Pa. or Rockwell International, S.A., Geneva, Switzerland; Canadian Valve Licensee: Peacock Brothers, Limited.

ROCKWELL-Nordstrom VALVES

another fine product by

ROCKWELL

See the HYPRESPHERE in action at the AGA Convention "Mall of Flame".

Rockwell Manufacturing Co.
Pittsburgh 8, Pa.

Gentlemen:

Please send me further information on Rockwell Hypresphere valves. Bulletin V-607.

Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

Announcing
Change of Name
Foreman Pipeline Industries
formerly
Cleaner Pipelines Company

INTERNAL PIPELINE CLEANERS
Carefully Designed
Durably Built
Efficient
For coated or non-coated pipelines

SQUEEGEES
NIGHT CAPS
SUPPORT INSULATORS
PIPELINE TOOLS AND SUPPLIES

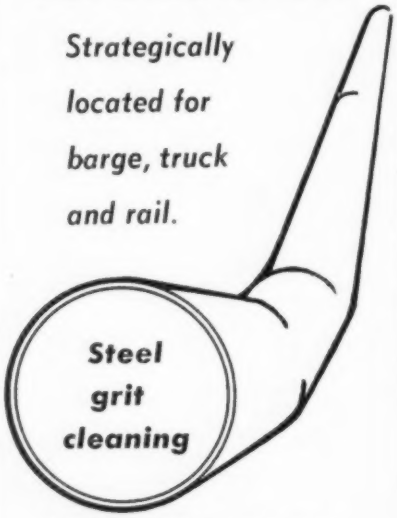
'Service is our Policy'

Foreman Pipeline Industries
1900 Armour Road
North Kansas City, Mo.
VIctor 2-100

FASTER— MORE ECONOMICAL

PIPE COATING

Strategically located for barge, truck and rail.



for further information, write:

SOUTHERN PIPE COATING, INC.
MEMPHIS, TENN.
Box 2264 **WH 2-2226**

Motorola Inc. Announces Several Communications Division Changes

Motorola Inc., Communications Division announces several recent promotions. Edward L. Falls, Jr., has been named executive assistant to the general manager of the division. Falls, as a vice president of Motorola Communications & Electronics, Inc., formerly managed sales and service of radio communications products in the southern states. With Motorola for 16 years, he is headquartered in Chicago.

Robert N. Swift, formerly vice president and manager of the midwest area, replaces Falls. He has been with the company since 1952, and has held various positions in sales, system design and sales engineering administration. Robert F. Davis succeeds Swift. He has been a member of Motorola's sales staff for 12 years and has been 2-way radio sales manager for the midwest area.

Wallace P. Miller becomes manager of the 2-way radio sales in the midwestern states. He has been with the company for 13 years and formerly was sales manager in New York. Replacing Miller is John Fussell, who has served Motorola in various capacities for 13 years. His most recent assignment was as regional manager for Maryland, Virginia, North Carolina and South Carolina.

Veeco Vacuum Corp. Opens Office in Redwood City, Calif.

Veeco Vacuum Corp., has opened an office in Redwood City Calif., to service western industry. Veeco is building an 84,000 square foot manufacturing plant in Plainview, N.Y. Formerly the company was represented in eleven western states by Carl Hermann Associates.

Coleman Cable and Wire Company Named Jones & Laughlin Distributor

Coleman Cable and Wire Company, River Grove, Ill., has been named a distributor of Jones & Laughlin Steel Corporation Wire Rope Division. The entire J & L line of wire rope and other lifting products will be handled by Coleman.

Cuno Engineering Corporation Names Clarkson Promotion Manager

Frederick H. Clarkson, Jr., has been named sales promotion manager of the Cuno Engineering Corporation, Industrial Division. He formerly was advertising manager of the Taft-Pierce Manufacturing Company.

Grove Valve & Regulator Names Romano Louisiana Sales Engineer

Al Romano has been appointed sales engineer in southern Louisiana by Grove Valve and Regulator Company. He comes to Grove after several years of experience in the petroleum and gas equipment field. He has been associated with Shaffer Tool Works and is former co-owner of LIR Construction Company, Inc., Lafayette, La. He will headquarter at Houma, La.

American Meter Company Announces Appointments

American Meter Company announces the appointments of Alfred S. Erwin as sales representative and Charles R. Docis as a member of the Advertising Department.

Erwin will headquarter in Philadelphia. Erwin and Docis recently completed a six month gas measurement school at Erie, Pa.

John Stoddard Transferred To Brown-Fogle Equipment Co.

John Stoddard has been appointed to coordinate sales to pipe line contractors at Brown-Fogle Equipment Co. Stoddard had been with the Southern Equipment Tractor Company, an affiliate of Brown-Fogle. Brown-Fogle is the successor to Benson Tractor Company.

Dearborn Chemical Names Terry Laboratory Manager

Lewis I. Terry has been named laboratory manager by Dearborn Chemical Company. He will have charge of laboratory business and personnel administration, also coordinating research and development projects.

Terry had been director of analytical services. He is succeeded by Richard A. Larrick, formerly head of materials testing and analytical laboratory at General Electric Company's Hudson Falls, N.Y., plant.

Atlas Valve Company Appoints McPherson Sales Representative

Atlas Valve Company has appointed Harry McPherson a sales representative. He will represent Atlas in Kansas, Iowa and Nebraska.

Write for Bulletin
PIPELINE VENTS AND MARKERS

FLEET-LINE CO.
P. O. BOX 276-K
SHREVEPORT
LOUISIANA

CLASSIFIED ADVERTISING

LINE PIPE

SPOT—HOUSTON, TEXAS

Black, Electric Resistance Welded Steel Pipe, Double Random Lengths, Plain Ends, Beveled for Welding, API Specification 5L, Grade B, Moody Inspected and Certified.

8⅝" O.D. x .203 Wall—18.27 lbs/ft
8⅝" O.D. x .250 Wall—22.36 lbs/ft
10¾" O.D. x .203 Wall—22.88 lbs/ft

Hugo Neu Corporation
45 Nassau St., New York 5, N.Y.
Tel.—REctor 2-1334

■ For sale, rent, or lease: Twelve-inch portable hydraulic dredge, Caterpillar powered. Bid prices given. Sale price $40,000. Half down. Marine Construction Company, 2325 Welch, Houston 19, Texas, JA 3-9020.

to move the world...

"Give me a place to rest my lever
and I will move the earth." So spoke Archimedes.

The lever of our modern world is natural gas and oil.
They turn the wheels of industry...
fuel and lubricate our cars, planes and trains...
heat and cool our homes... cook and refrigerate our food.

Indispensable, steadily broadening in usefulness...
it's difficult to imagine a world without gas and oil.
Fortunately, there's plenty. To serve its pipeline
customers alone, Tennessee Gas maintains natural gas reserves
of 18 trillion cubic feet... a 20-year supply.
And world reserves of gas and oil are at an all-time high.

Comforting thought for Americans
whose high standard of living is built on energy:

The more gas and oil we use, the more we discover.

From natural gas and oil...heat, power,
petrochemicals that mean ever wider service to man.

TENNESSEE GAS TRANSMISSION COMPANY
HOUSTON, TEXAS
DIVISIONS: Tennessee Gas Pipeline Company · Tennessee Gas and Oil Company · Tennessee Oil Refining Company · Tennessee Overseas Company · SUBSIDIARIES: Midwestern Gas Transmission Company · East Tennessee Natural Gas Company · Tennessee Life Insurance Company · AFFILIATE: Petro-Tex Chemical Corporation

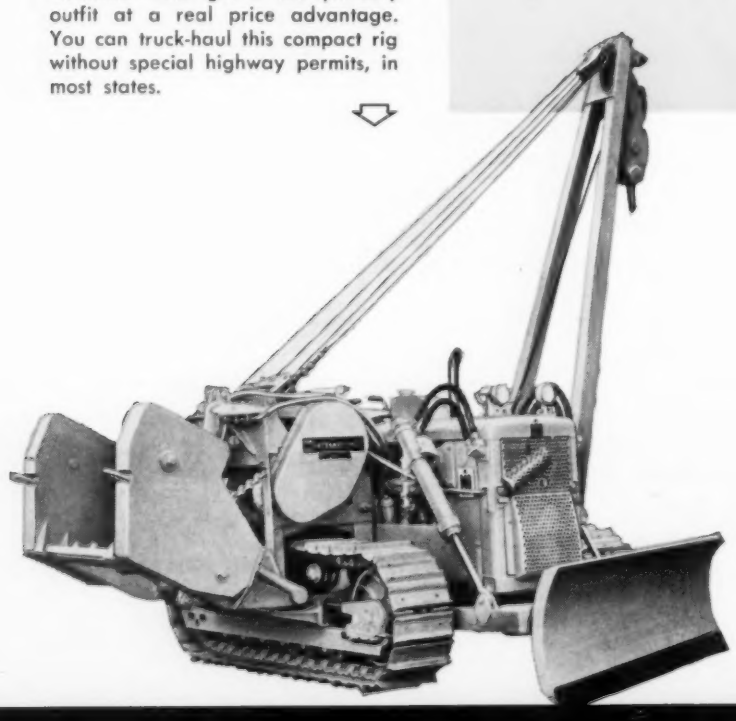
For more data on advertised products, use Readers' Service Cards, last page.

While waiting for a dragline to dig more trench, the backfiller-equipped TD-15 "boom" busies itself covering laid line. TD-15 undercarriage strength tops the industry—platformed by precision-welded, gusset-braced box-beam frames—to carry heavy super-imposed loads!

Here's the TD-15 "boom" teaming with a dragline, to lower-in 18" pipe—building a new gas line for Northern Indiana Public Service Co. The TD-15 gives you the track roller dependability of Dura Rollers—the ones with thick, deflection-proof shells; and pressure-relief passages that protect seals from overlubrication and make 1,000-hr. lube intervals practical!

NEW TD-15 "BOOM" ha punches-up small sp

New bottom-hinged, hydraulic counterweight International Superior TD-15 sideboom lifts 46,500 lbs. at 4'. Add the hydraulic blade backfiller—and get a multiple-duty outfit at a real price advantage. You can truck-haul this compact rig without special highway permits, in most states.



Four or five sections of 18-inch pipe make an eas load for this International Superior TD-15 hydraul counterweight sideboom. At 4-ft. overhang the rig ca lift 46,500 lbs.—and with the blade backfiller on th "15," lifting capacity climbs to 48,820 lbs.!

Here the "15" leapfrogs with a dragline to lay lin till they run out of trench. Then the "15" doubles bac and backfills laid pipe, while a second dragline dig more ditch! No overstaffing or overequipping with th "15" to punch-up the spread's efficiency!

Biggest lifter in its hp class, this Internation Superior "boom" is powered by the 6-cylinder, 105-h TD-15 tractor. On the job, this load-speeding rig give you 6-roller, rigid-track traction, with 98⅜" track-on ground length and 24" shoes.

M" handles pipe . . . backfills . . . nal spread efficiency

High-clearance hinge points on this sideboom provide maximum clearance in soft footing. Underside design is clean—with engine and transmission guards completely enclosed. Levers are stacked for operating ease and safety. Single drum on each shaft provides wear-saving cable alignment. All drums are gear-driven for long life and quiet operation. Fleeting sheaves on load and boom lines prolong cable life by preventing piling and crushing.

"Boom" operating ease is matched by TD-15 ease and speed of control. "Single-stick," speed-pattern shifting of the 6-speed full-reverse transmission—*plus* Shuttle-Bar forward-reverse control and *decelerator* —add up to an exclusive brand of work-speeding maneuverability!

See your International Superior Distributor—compare big production TD-15 sideboom features to competitive rigs. See for yourself how this easy-to-haul fast-stepper lowers-in pipe as big as 24"—strings 36" pipe — does pipeline utility and maintenance with stand-out economy. Ask for a demonstration!

International Harvester Company, Chicago 1, Illinois

INTERNATIONAL®

SUPERIOR

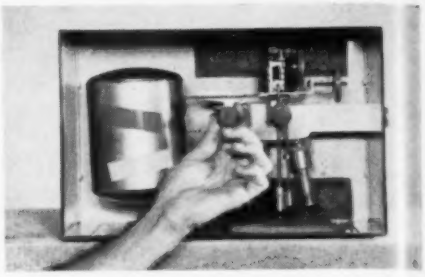
What's New in EQUIPMENT

Aluminum Pipe Welder

Development of a portable automatic welding machine for butt welding aluminum pipe has been announced by Aluminum Limited (Canada). The relatively small machine, which comes in sizes from 40 to 50 pounds, can be used to weld pipe up to 4½-inches.

The unit operates with conventional engine driven dc power sources, is simple in design and requires no specialized service. The machine clamps around the pipe and welds the joints in less than a minute. It is designed as a low cost, easily portable unit and can be operated after only a short training period.

For more data, circle **No. E1** on Readers' Service Card, last page this issue.



Gas Detection Instrument

An air density monitor which operates on a mechanical balance principle, allowing it to work continuously without power or an attendant, has been introduced by Detectogas Instruments, Inc. Explosion-proof switches can activate any type of alarm system when changes in air density caused by gas accumulation occur. The unit automatically compensates for changes in temperature, humidity and atmospheric pressure.

The monitor can be installed wherever an accumulation of industrial or heating gas could jeopardize human life and property such as pipe line stations, refineries, schools, etc. The low cost unit is manufactured for Detectogas by Texas Instruments Inc. Battelle Memorial Institute was design and development consultant. Testing has been done by Bowser-Morner Testing Laboratories and Inland Testing Laboratories.

The way it works. When density of air surrounding the monitor balance changes appreciably due to presence of foreign gases or vapors, the instrument moves out of balance, closing a switch which activates the alarm. A permanent magnet stabilizes the balance against normal vibrations and air currents.

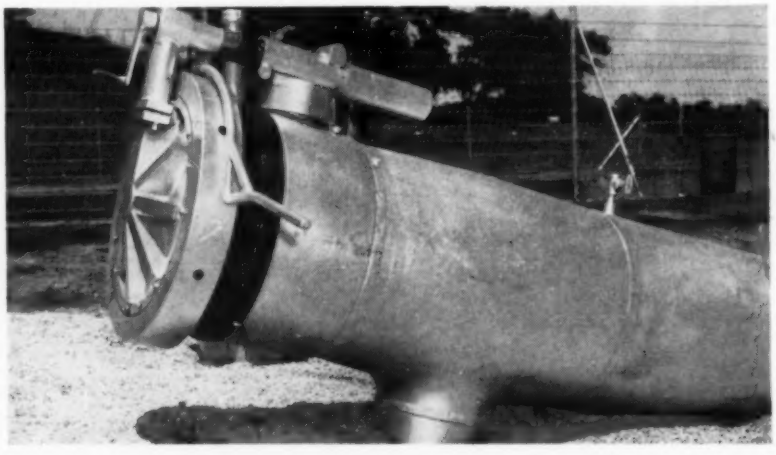
For more data, circle **No. E3** on Readers' Service Card, last page this issue.

Dewpoint Recorder

Introduction of a new dewpoint recorder which automatically and continuously measures, indicates and records the moisture content of gases has been announced by Weighing & Control Components, Inc.

The unit determines moisture content of gas by measuring its dewpoint, the temperature at which vapor first condenses. A photoelectric null system is used to measure the size of the dew spot formed on a metallic mirror by the gas condensate. Size of the dew spot is held in equilibrium by heat automatically applied as needed to the mirror. The temperature of the mirror reads out to the dewpoint of the gas, which in turn describes the moisture content. Readings are independent of test-gas temperature.

For more data, circle **No. E2** on Readers' Service Card, last page this issue.



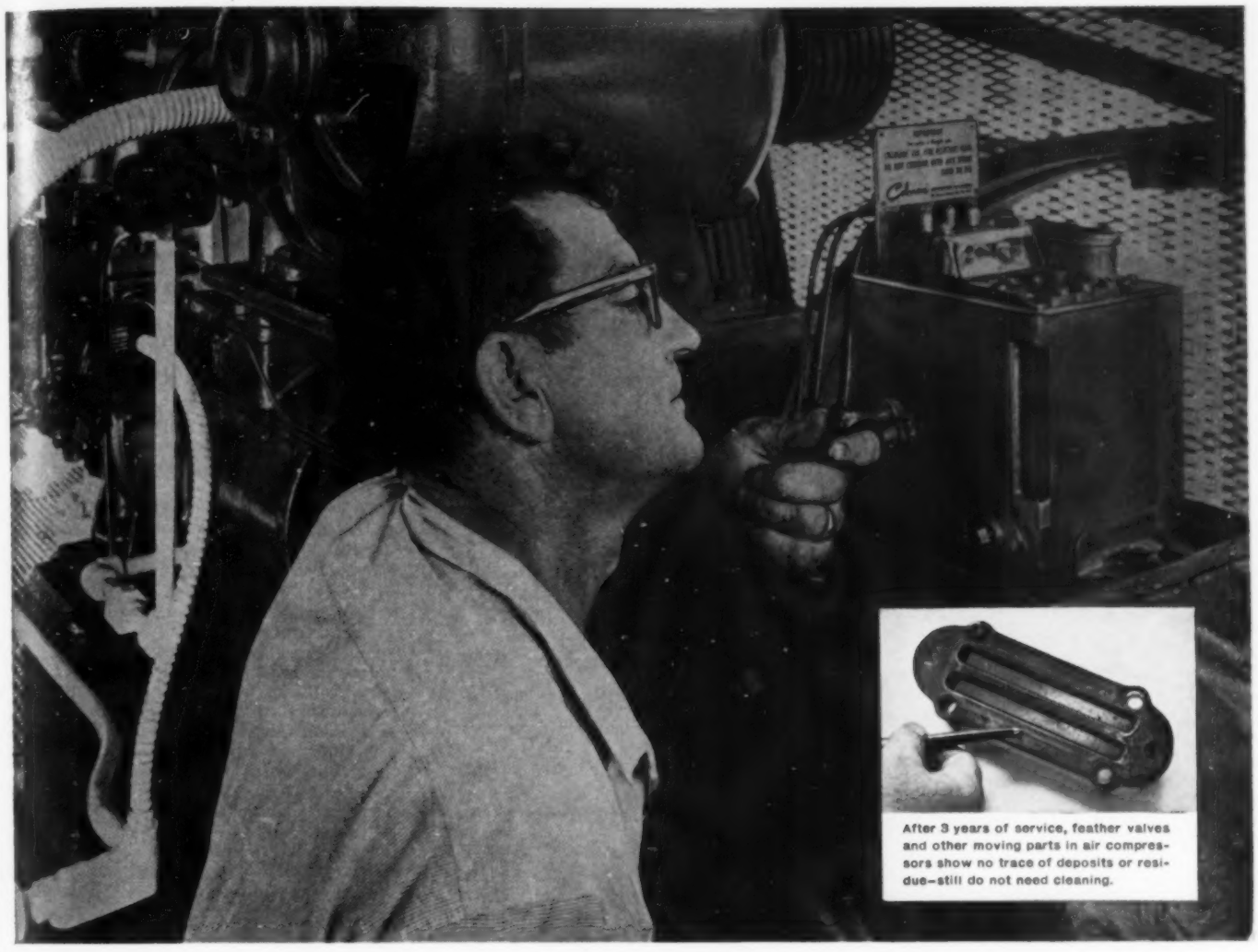
Quick Opening Closure

A quick opening closure for scraper traps, gas scrubbers, pipe line strainers and pressure vessels is available from Moorlane Company, Tulsa. It provides quick opening fitting with a closure head having a beveled seat and "O" ring gasket and is leakproof in operation.

The closure head is axially movable on an overhead arm which swings laterally about a pedestal, to expose the full open end of the vessel. The head assembly is moved by a hand crank attached to a threaded shaft in the overhead arm. When threaded head is unscrewed from the body, the complete head can be swung 90 degrees about the pedestal. For ease of operation, the entire hinge assembly is mounted on ball bearings.

To close, the head is swung back into position and the hand crank is operated to move the head with the threaded nut into position for engagement with the threads. All bearing surfaces are equipped with Alemite fittings for pressure lubrication.

For more data, circle **No. E4** on Readers' Service Card, last page this issue.



After 3 years of service, feather valves and other moving parts in air compressors show no trace of deposits or residue—still do not need cleaning.

"Cellulubes eliminate fires and explosions ... keep compressor parts clean"

says MR. T. E. DANIEL, Foreman, Cypress Compressor Station
Trunkline Gas Company, Cypress, Texas

"Since using Cellulube 220 in our air compressors we have never experienced or had any indication of fire or explosion in our compressed air systems," continues Mr. Daniel.

Installed at Trunkline's Cypress Compressor Station when it opened three years ago, Cellulubes thus provide an authoritative 7800-hour operating record that indicates not only efficient and far safer operation, but substantial savings as well. Mr. R. C. Carter, Trunkline's Compressor Department Superintendent, describes them thus:

"First and most important, of course, is the elimination of any risk to our personnel—from fire, explosion, or fragmentation. Secondly, we save on heavy equipment replacement costs, and thirdly, down-time losses.

"A major savings is in preventive maintenance. Formerly, we completely disassembled and cleaned air compressors every six months. Cellulubes keep machinery so clean that this interval has been indefinitely extended, and so far we've saved at least 60 man-hours. Finally, Cellulubes never get 'dirty,' nor do they burn away by friction or compression."

Cellulubes . . . the *safe* lubricants and hydraulic fluids . . . are available in six controlled viscosities. If you'd like a sample for evaluation, please let us know the application involved.

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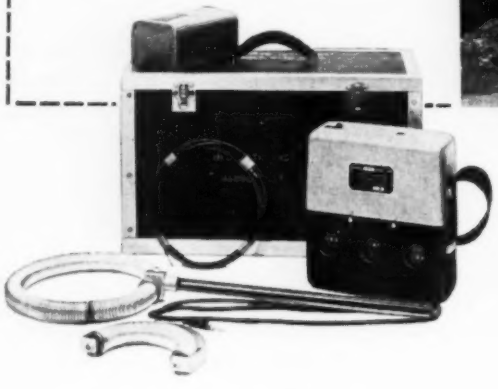
Maintain Coating Application Standards

INSPECT WITH A TR HOLIDAY DETECTOR!



EP HOLIDAY DETECTOR
Portable, "damp-climate," pulse type holiday detector for coated surfaces.

To obtain maximum protection and hold maintenance costs to a minimum, inspect protective coating with a Tinker & Rasor Holiday Detector and make repairs before backfilling. Minutes spent inspecting the pipe with a Tinker & Rasor Holiday Detector while the ditch is open can save days making repairs later on. Clearly, if protective coating is desirable, the best possible protective coating is *most* desirable.

Every holiday in your protective coating increases the current requirements of cathodic protection. The result is constantly increasing maintenance costs.

Insure your pipeline's future with inspection by Tinker & Rasor Holiday Detectors. Write today for technical data and bulletin.

Engineering Note:
To insure a successful application, your specification should include TR Holiday Detector inspection. Write for specification guide.

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Quality control for coating application

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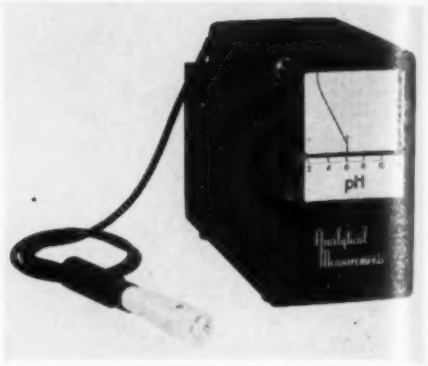
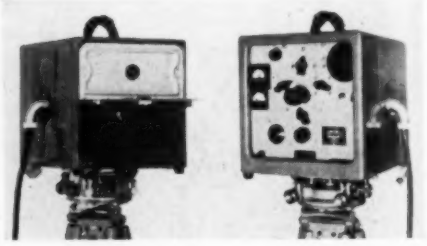


Recording pH Meter

A combined pH meter and strip chart recorder is available from Analytical Measurements, Inc. The instruments use an electronically modulated amplifier that compensates for line voltage fluctuations and uses standard radio tubes. A strip chart recorder forms the front panel of the instrument and contains a 63-foot roll of chart paper that will last for 31 days at 1-inch per hour.

Other chart speeds are available up to 16 inches per hour by a simple gear change. A pressure sensitive coating is used on the chart paper so that ink and clogged pen problems are eliminated. Automatic temperature compensation is provided for with connections for insertion of a platinum resistance thermometer. A switch on the front panel permits disconnection of the chart drive so that the instrument becomes an indicating pH meter.

For more data, circle **No. E5** on Readers' Service Card, last page this issue.



Surveying Instrument

An addition to the line of electronic distance measuring equipment has been announced by Geodimeter Company, a Division of AGA Corporation of America. The new Model 4B offers several new advantages over earlier models. Some features include a reading dial numbered to every 10 divisions and, thereby improving readability; a course site included within the instrument; a Kerr cell heater installed in the instrument, permitting operation in a range of temperatures from minus 40 F to plus 120 F, and a new phase selector switch which permits faster reading, less chance of errors.

For more data, circle **No. E6** on Readers' Service Card, last page this issue.

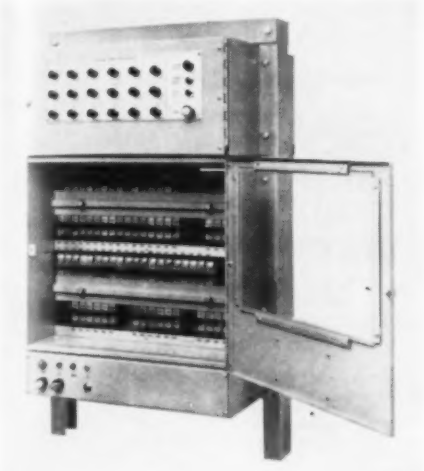
Pneumatic Relay

Fischer & Porter Co. announces a pneumatic computing relay, the Force Bridge, available in different models for various computations.

It operates on a force balance principle. The bridge consists of two weighbeams

that rotate on a common moveable fulcrum. Because of the force-balance principle, friction and hence error are reduced to a minimum—as low as 0.5 percent from 20 to 90 percent of scale. The force bridge is immediately ready for use after installation of input and output tubing and the 20 psi air supply.

For more data, circle **No. E7** on Readers' Service Card, last page this issue.



Electronic Scanning System

An electronic system which performs monitoring, alarm and remote control station on-off control functions has been developed by Lynch Communications Systems Inc. The system provides unattended operations of stations and other installations and utilizes solid-state circuitry throughout.

The standard B-1000 series equipment provides up to 36 separate functions which may be transmitted over a single pair of wires on a DC or tone channel basis. The system is of modular design so that if additional functions are required for monitoring, supervision or control, a series of systems can be installed. In addition, it may be installed in stages to the point where an entire electric utility grid, for example, could be supervised and operated automatically.

For more data, circle **No. E8** on Readers' Service Card, last page this issue.

Wheeled Traxcavator

A new wheeled traxcavator has been introduced by Caterpillar Tractor Co. The Cat 966 is a 140 net horsepower unit with a 2¾-inch cubic yard bucket as standard. An open cockpit permits easy accessibility from either side; all loader lift mechanism is located ahead of the compartment.

The unit is capable of 24,000 pounds breakout force. Turning radius measured

Joe Roughneck's solid source of supply...

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Wheel of plenty! Welding pipe by electric resistance weld process. Lone Star API pipe is fully normalized.

Joe Roughneck, of course, is symbolic of the men who have made the fabulous oil and gas industry tick . . and Lone Star Steel's huge completely integrated plant is right in the middle of Joe's workshop. Lone Star pipe is quality-controlled from mining of ore to finished pipe. In addition to operating day and night to supply Joe's pipe needs . . Lone Star has recently completed new and even larger facilities.

Neighbor, wherever you are, specify Lone Star and we both get a good deal!

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For more data on advertised products, use Readers' Service Cards, last page.

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that doesn't chatter

Check the Daniel Piston Controlled Check Valve for quiet efficiency in preventing flow reversal. Choose from stock in sizes and types covering a wide range of both compressible and non-compressible fluid services. Patented, free-floating piston design eliminates chattering and minimizes pulsation. Available in carbon or cast alloy steels with stainless trim, or with hard-faced internals for mud-line service. Up to 10,000 lbs. A.S.A. ratings.

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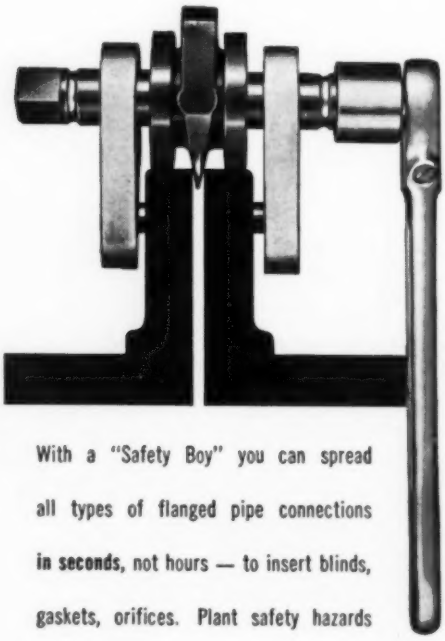


A PIPE DREAM COME TRUE

"SAFETY BOY"
AT LAST! A TOOL TO SPREAD PIPE FLANGES SAFER — FASTER — MORE ECONOMICALLY — IN TIGHTEST WORKING SPACE.

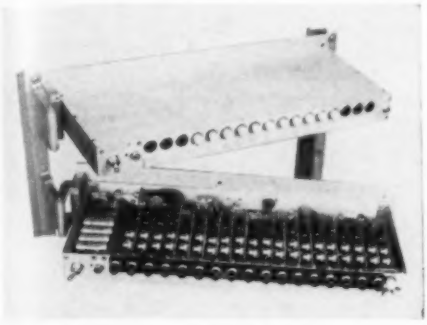
For Catalog Sheet, Write:
Wm. L. Riggs Co.
600 S. 129th E. Ave.
P. O. Box 5002
Tulsa, Oklahoma

With a "Safety Boy" you can spread all types of flanged pipe connections **in seconds**, not hours — to insert blinds, gaskets, orifices. Plant safety hazards and costly down time are eliminated by switching to this really modern pipefitter's tool — "Safety Boy." Wherever there's piping there's a need for "Safety Boy" — the handiest tool ever invented for work in cramped quarters. Lightweight and easy-to-carry, "Safety Boy" is reasonably priced for wide usage.

at the outside rear tire is 20 feet, 9 inches and ground clearance is 17½ inches.

(This item supplements Caterpillar Tractor Co. data on Pages 66-69 of the Pipe Line Catalog, Third Revision.)

For more data, circle **No. E9** on Readers' Service Card, last page this issue.

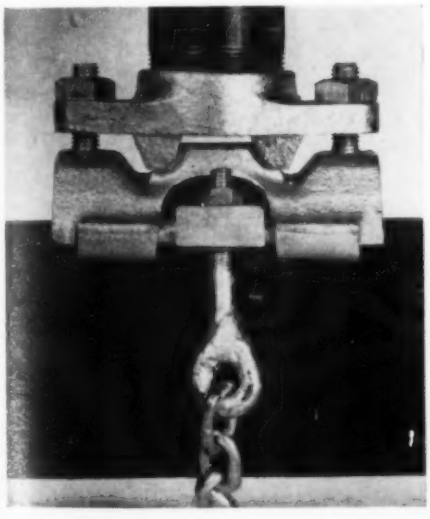


Microwave Fault Finder

A transistorized fault alarm for microwave systems capable of reporting 11 or 17 different fault conditions from as many as 30 remote stations has been developed by Collins Radio Company.

A transmitter at each remote station continuously scans for faults and simultaneously reports all present to its associated receiver at a supervisory station every four seconds by means of a single AM tone. Both transmitter and receiver display fault reports by means of lights on the front panel, with a separate light for each fault. Receiver also has lights for a confidence check on the transmitter and on received data. A remote alarm signal is also provided by the receiver.

For more data, circle **No. E10** on Readers' Service Card, last page this issue.



Pipe Saddle

Employing the "chain-tong" principle, M. N. Aitkens Company has developed a new type pipe saddle. Designated as the "Universal Leveling Saddle", it will fit all pipe sizes from 1½ to 16-inch.

The zinc-coated pipe saddle uses a chain which wraps around the pipe and is quickly and easily tightened with a single bolt at one side of the saddle.

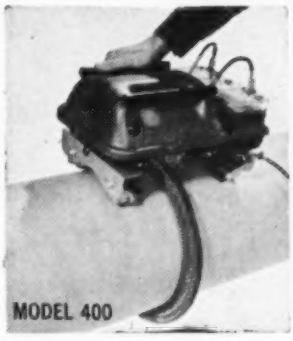
For more data, circle **No. E11** on Readers' Service Card, last page this issue.

Spy Detector

QUALITY SERVICE

is there . . . when you need it!

. . . our SPY HOLIDAY DETECTORS are as near as your telephone—in fact, in emergencies our own plane assures immediate service.



Rugged equipment for dependable holiday detection on ¾" to 36" pipe . . . signal—bell, light and spark . . . unaffected by dew or frost.

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Pipeline Inspection Co., Inc.

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- ☐ COMPRESSED AIR FOLDER
- ☐ HYDRAULIC FLUID MANUAL
- ☐ GENERAL CATALOG

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Company_____

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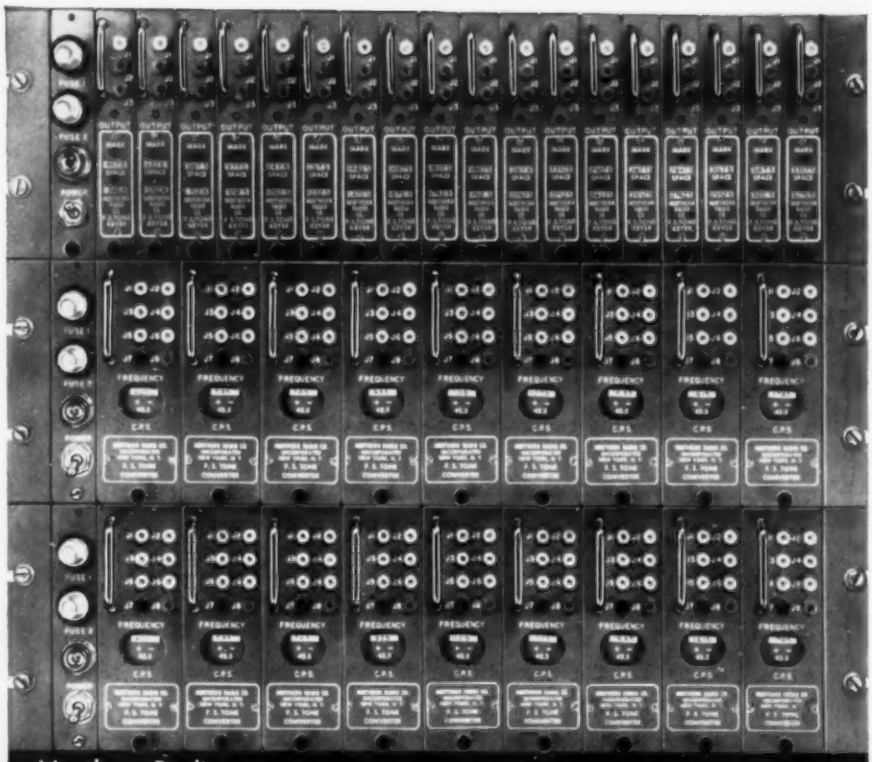

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18 CHANNELS in 15¾" panel space

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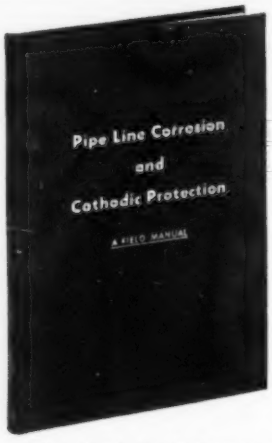

The most practical on-the-job manual for men concerned with pipe line corrosion.

Pipe Line Corrosion and Cathodic Protection

By MARSHALL E. PARKER

This book is designed as a practical field manual. It provides workable methods that can save you valuable time and effort in obtaining interpretive field data.

Contents (Condensed). Soil Resistivity Surveys, Pipe-to-Soil Potentials, Line Currents, Current Requirement Surveys, Rectifier System for Coated Lines, Ground Bed Design and Installation, Magnesium Anodes on Coated Lines, Hot Spot Detection, Stray Current Electrolysis, Interference in Cathodic Protection, Operation and Maintenance, Coating Inspection and Testing.

Appendices cover: Fundamentals of Underground Corrosion, Basic Principles of Cathodic Protection. Plus . . . tables and properties of metals, attenuation equations and index.

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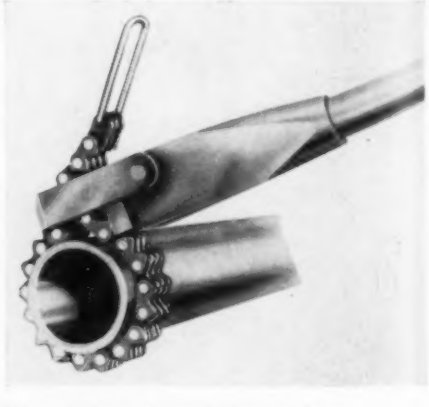
Telephone Computers

Two-way communication between computers at the rate of 150 numbers or letters a second is attainable with International Business Machines Corporation 1009 data transmission unit. This enables two widely separated computers to exchange information directly over the telephone—while each prints out the results of calculations. The new product is designed to link the magnetic core of memories of solid-state IBM 1401 computers over regular local or long distance telephone and telegraph lines.

The 1009 enables the 1401 computer to be used as either a data transmission or data receiving terminal, as well as a regular data processing system. Input for transmission can be fed into the computer from punched cards or magnetic tape. Business or scientific data is transmitted from the core storage of one 1401 to the core storage of another 1401 at the receiving end.

For more data, circle **No. E12** on Readers' Service Card, last page this issue.



Pipe Turning Wrench

A new type pipe turning wrench which features a completely new application of the use of torsion to exert a positive but smooth grip around the entire circumference of pipe, has been introduced by Aladdin's Products, Inc.

The wrench is designed to turn round odd shapes of pipe, tubing, hardened steel shafts and threaded parts without slipping, scratching or gouging the surface, or distorting the shape. It combines the advantages of chain and strap wrenches with the new use of torsion action.

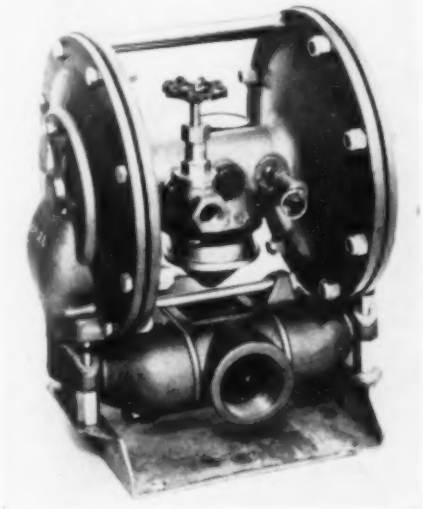
For more data, circle **No. E13** on Readers' Service Card, last page this issue.

Flow Switch

Development of a new Model V-4 vane operated by magnetically actuated and explosion-proof flow switch has been announced by W. E. Anderson Inc. The instrument is a smaller, more compact, simplified and more economical version of the V-3 switch. On the new switch, "O" rings have been eliminated in favor of one-piece switch body design.

The V-4 offers such features as working pressure of 2,000 psi, one-piece switch housing milled and bored from solid block of non-porous material, magnetic actuation, response only to product flow, and an electrical assembly which can be removed for inspection without shutting down pipe line operations.

For more data, circle **No. E14** on Readers' Service Card, last page this issue.



Utility Pump

A portable, air or gas operated, double diaphragm, utility pump has been introduced by Texsteam Corporation. The unit operates on pressure from 5 to 100 psi and provides closely controlled discharge volumes from 1 to 60 gallons per minute.

The pump handles solvents, slurries and liquids containing solids to ¼-inch in diameter with ease. A variety of uses has been found for the multi-purpose unit in construction, marine and industrial applications.

For more data, circle **No. E15** on Readers' Service Card, last page this issue.

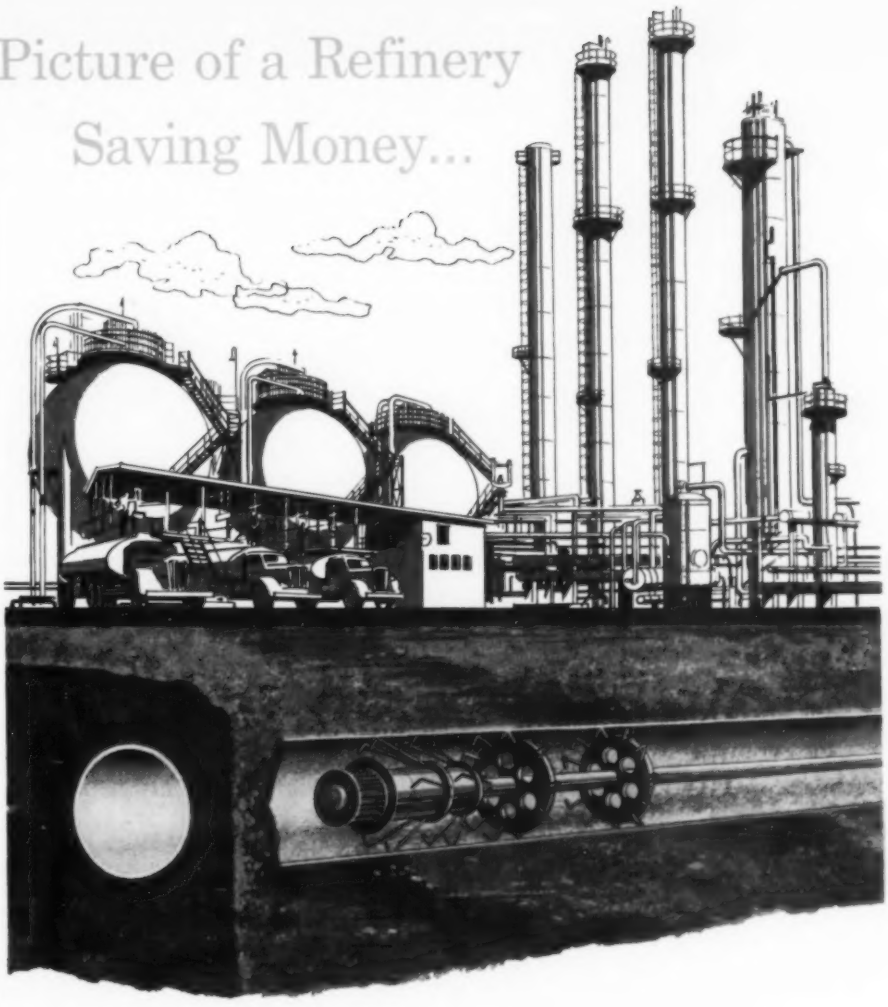
Tractor Hoods

International Harvester Company's Construction Equipment Division has made available a heavy-duty hood as standard equipment for the TD-9 and TD-6 crawler tractors equipped with Drott Skid-Shovels.

The hood provides additional protection for the engine and dash groups. The hood meets flush with the top of the radiator guard, preventing material from entering under the rear edge of the guard. A heavy cover, hinged at the rear, protects the radiator cap and filler neck.

For more data, circle **No. E16** on Readers' Service Card, last page this issue.

Picture of a Refinery Saving Money...



Spunline Relines Pipe Lines in-place without removing the pipe

Another refinery, it could be in Texas, California or Montana, will soon be enjoying the savings of another rehabilitated pipe line. The flow will increase, the pumping cost will drop and the pipe line will be good as new for at least another quarter of a century.

And traffic will move without interruption or inconvenience to the public.

Spunline® is applicable to pipe lines down to 4" and may be used in cast iron, steel, concrete and wrought iron pipe lines.

Write, wire or phone PIPE LININGS Inc.

Subsidiary of American Pipe and Construction Co.

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CATHODIC PROTECTION EXPERTS
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for Greater
SPEED, ECONOMY!

Experienced corrosion engineers *(such as Cathodic Protection Service of Houston and Tulsa)*, select JAQUES Hydraulic Earth Augers as the most effective tools for installing anodes in any kind of soil, faster, more economically. JAQUES jeep-mounted KV-515 can be quickly positioned for high-speed drilling of anode holes up to 12" diameter, up to 15' deep. JAQUES TJ-254 mounts on standard trucks, digs holes to 48" diameter, up to 25' deep, in hardest soil or rock. For FREE demonstration or literature with detailed specifications, write today to . . .

TEXOMA ENTERPRISES, INC.

JAQUES Jeep-Mounted KV-515 in actual operation by Cathodic Protection Service in Houston, Texas, drilling one in a series of 25, 9½' anode holes for protection of 30-inch steel pipeline.

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Get MAXIMUM Cathodic Protection ECONOMICALLY with *JAQUES!*

EL PASO NATURAL GAS COMPANY
assured of 100% reliable microwave communications with . . .
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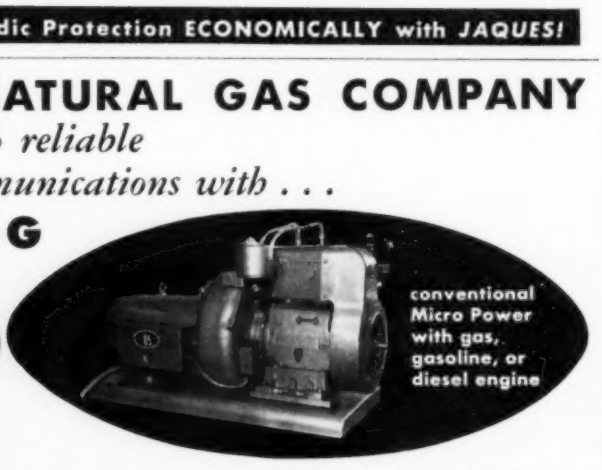

MICRO POWER

Heart of the microwave communications link between the Williams and the Seligman, Arizona, compressor station of El Paso Natural Gas Company is a United States Motors Corporation Micro Power. The engine of the conventional Micro Power in this case is replaced by a DC motor which is fed from the station batteries, from which all supervisory and telemetering equipment operates. Should the AC commercial power fail, the Micro Power continues to supply the microwave without voltage drop, droop, or break. Micro Power operates from, but isolates the microwave from the commercial power and removes the bad effects of voltage dips and peaks.

MICRO POWER operates with the main source of power. There are no transfer switches, no starting batteries with Micro Power. Available in 1500, 3000, 5000 and 10,000 watt capacities; for gas, gasoline or diesel engine emergency drive. For complete information, write . . .

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Literature

For more data on New Equipment or copies of Catalogs and Literature reviewed in this issue, use the Reader Service postcards just inside the back cover and facing the Advertisers' Index. Simply circle code numbers of items desired—sign and mail card.

Ball Valves

New top-entry, top adjusting thermoplastic ball valves made of UPVC or "Penton" chlorinated polyether are described in a bulletin published by Tube Turns Plastics Inc.

The four-page, two-color bulletin, "Ball Valves for Corrosive Service," describes the new line's corrosion resistance characteristics and on-the-line maintenance features and gives dimensions for threaded, socket and flanged-end-type valves in ½-inch through 2-inch nominal pipe sizes.

To get a copy, circle **No. E17** on Readers' Service Card, last page this issue.

Tape Talk

A four-page brochure has been issued by Plicoflex, Inc., describing its polyvinyl-butyl tape. The tape is applied over a rubber base primer for a tighter bond.

The bulletin describes the use of a primer with the tape and gives a general description of the different types of plicoflex coatings.

To get a copy, circle **No. E18** on Readers' Service Card, last page this issue.

Dry Scrubbers

A descriptive folder on its dry scrubbers has been issued by Pearless Manufacturing Co. The dry scrubbers use centrifugal force to separate solid and liquid particles from gas. Multiple small diameter cyclones arranged in parallel are used to achieve results on small as well as large particles. Any desired capacity is afforded by providing a sufficient number of tubes in parallel in a suitably sized vessel. Diagrams and capacity formula are supplied to facilitate ordering.

To get a copy, circle **No. E19** on Readers' Service Card, last page this issue.

Computer Report

Computer Systems, Inc., has published a 16-page technical report, "Mathematical Applications of the Dynamic Storage Analog Computer." The report details the applications of the DYSTAC computer which innovates automatic repetitive operation at frequencies of 60 cps and high-speed memory with a tracking error of less than one microsecond. Also discussed are sequential calculations through time sharing of computer elements; use of memory to obtain definite integrals for automated; self-solution of optimization problems, and solution of partial differential equations.

To get a copy, circle **No. E20** on Readers' Service Card, last page this issue.

Better Motors

A brochure, "The Fine Art of Building Better Motors" describes a new and unique Elliot Company integral horsepower motor.

The highly illustrated, 12-page brochure

covers step by step manufacturing process. The booklet shows how close tolerances and good alignment are built into a motor, from bracket to frame, frame to core, and shaft to rotor.

To get a copy, circle **No. E21** on Readers' Service Card, last page this issue.

Pipe Connections

A complete catalog of pipe connections and accessories designed on the new Grayloc seal principle has been published by Gray Tool Company. The 44-page manual contains all new types and ratings of Grayloc clamps, collar-type unions, flanges, vessel nozzles, closures and bleeder valves. Gray products with related applications are also cataloged, including bi-metallic pipe, fittings.

A special feature of the new literature is a 10-page table of allowable working pressure for pipe and connections from 1-inch to 30-inch inclusive to 1500°F. Relative costs of 39 piping materials are also tabulated in this working manual.

To get a copy, circle **No. E22** on Readers' Service Card, last page this issue.

Centrifugal Compressors

An eight-page brochure on the mechanical and hydraulic design considerations for two-stage centrifugal pipe line compressors has been published by Clark Bros. Co. Discussion outlines growth in compression ratio of pipe line boosters from 1.10 per impeller to ratios of 1.50 per impeller and higher.

Brochure concludes with a description of the new Clark two stage centrifugal compressor. The bulletin is highly illustrated with photographs and schematics.

To get a copy, circle **No. E23** on Readers' Service Card, last page this issue.

Compressed Air

Listing and describing standard type A dessicant dryers, a new technical bulletin has been published by Trinity Equipment Corporation.

The bulletin lists sizing information, as well as operational and mechanical specifications on the wide range of type A dryers available. The dryer employs electric, or steam on special order, heaters to reactivate the dessicant chambers. It provides dependable source of compressed air or gas with dewpoints down to —100° F.

To get a copy, circle **No. E24** on Readers' Service Card, last page this issue.

Repair Clamps

Information on how to minimize pipe line leak repair clamp inventory is explained in a new brochure published by Smith-Blair, Inc.

The means for reducing inventory investment are based on a Sta-Grid gasket of gridded neoprene backed with 26-gage stainless steel. Gasket material is cut to desired length and secured by as many of the Smith-Blair Quick-Bolting Redi-Clamps as required.

To get a copy, circle **No. E25** on Readers' Service Card, last page this issue.

How to detect moisture down to one part per million

CEC makes it easy, with the most complete line of moisture monitoring equipment on the market.

If you are faced with problems in product or system contamination by water, look into the capabilities of these rugged, reliable instruments:

26-301 and 26-302 Portable Moisture Monitors*—For lab and field use, the 26-301 measures water content of gas from 1-1000 ppm; the 26-302 measures from 1-20,000 ppm. Both units operate on 110V line power or accessory battery pack. *Bulletin CEC 1834-X8.

26-350 High-Pressure Moisture Monitor*—Designed initially for missile checkout, this instrument also tests water concentrations in high-pressure gas for many commercial applications. Maximum operating pressure is 6000 psig. *Bulletin CEC 1855-X9.

26-310 Process Moisture Monitor* for plant monitoring of gaseous process streams. The explosion-proof analyzer mounts directly on-stream. Remote control and continuous readout are provided in the control room. *Bulletin CEC 1845-X31.

CEC's 26-312 Liquid Process Moisture Monitor — The only instrument in existence for continuous and accurate measurement of water content in liquid-process streams. Bulletin CEC 26312-X2.

Analytical & Control Division CEC

CONSOLIDATED ELECTRODYNAMICS / pasadena, california

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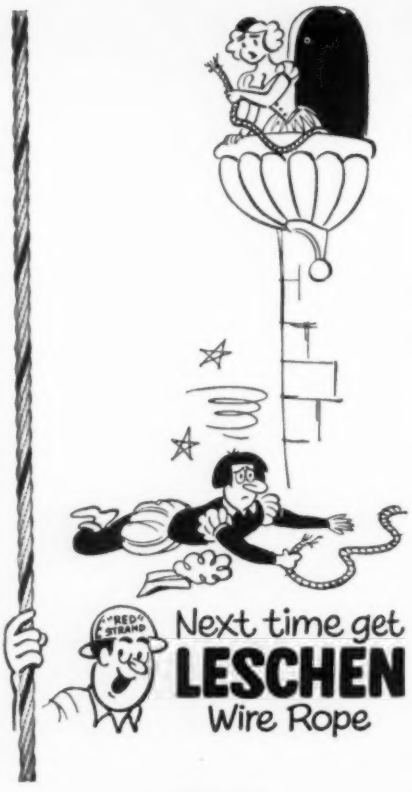

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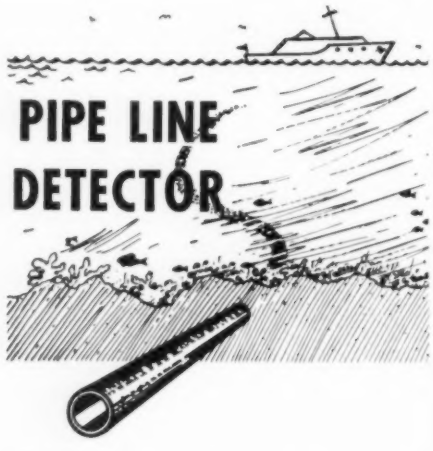
H. K. PORTER COMPANY, INC.



A *MARINE PIPE LINE DETECTOR* for river crossings, bays, marshes, and offshore—used to locate your pipe lines. This magnetic detector locates and determines the amount of overburden on your marine pipe—**Locates** them quickly, accurately, and economically.

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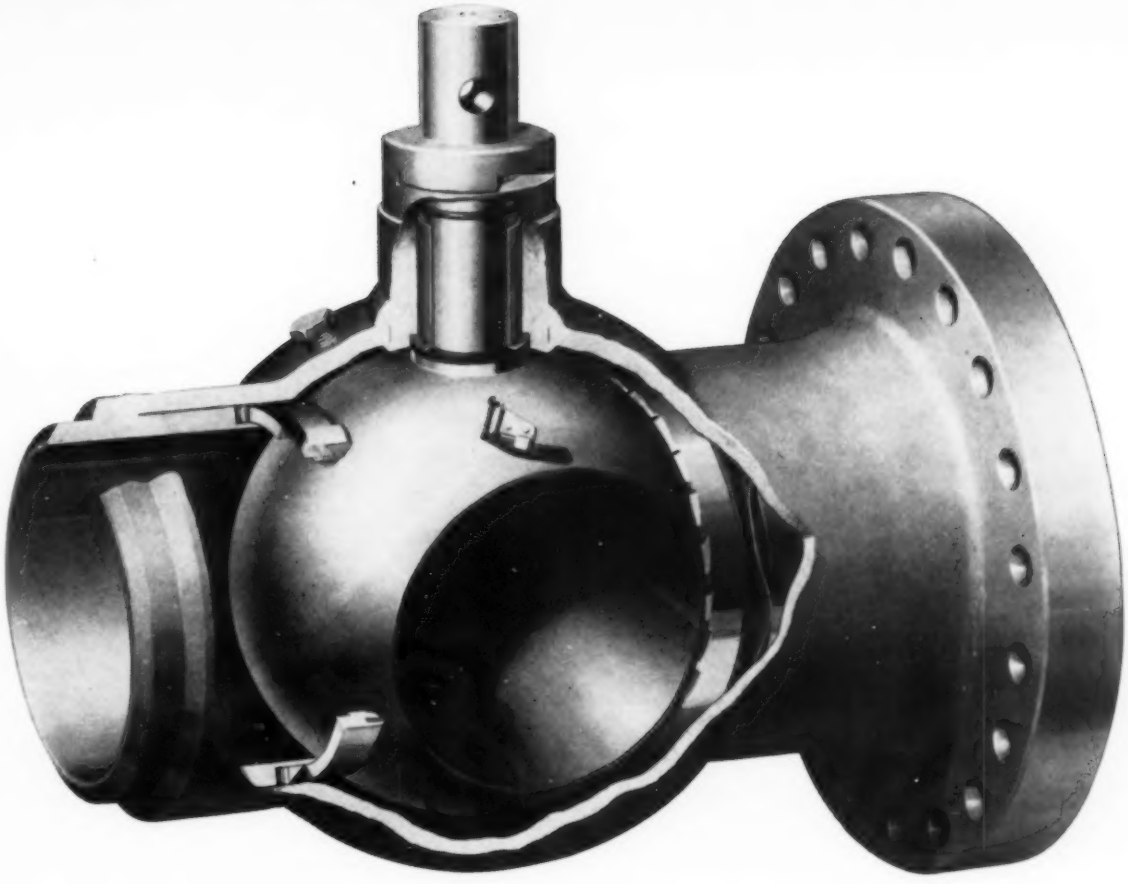

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These valves handle the most abrasive and corrosive fluids—cannot freeze—cannot develop excessive body pressure; provide up-stream seating, double block and bleed, all with unbelievably easy operation.

They can be supplied in any material, size 2″ or larger to required working pressures and with any type or style of operator desired. The Cameron Ball Valves can be delivered from factories located in United States, Canada, Mexico, England and France.

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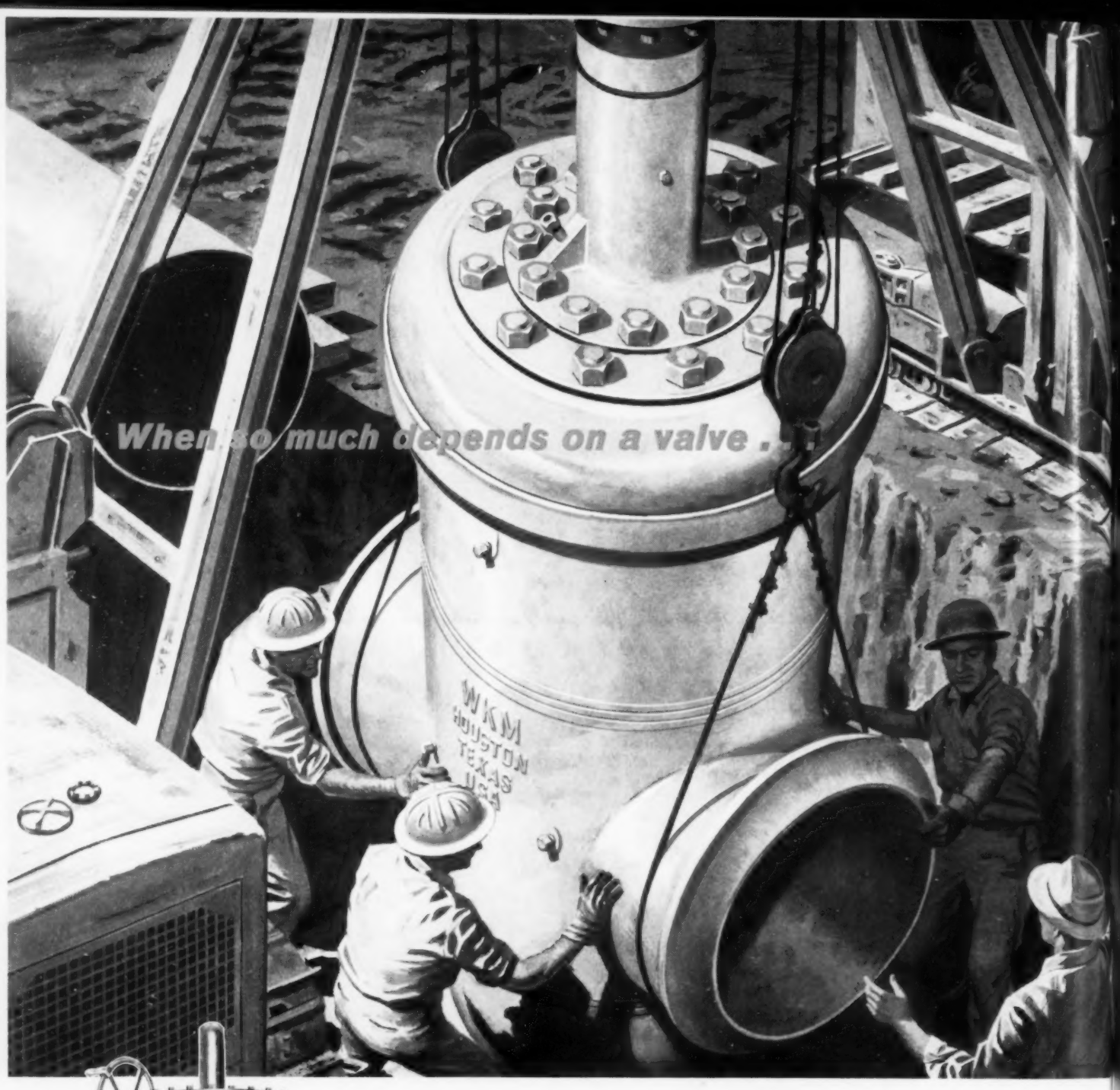

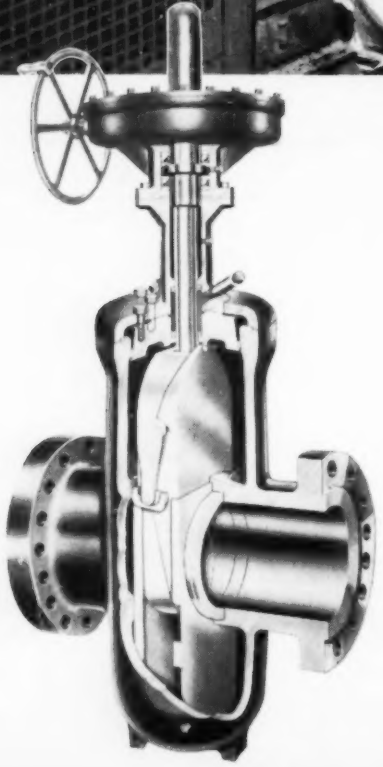

W-K-M Expanding Gate Valves seal positively with *controlled force*

You exert unique control over the seating in W-K-M Expanding Gate Valves. Fully opening or closing the gate causes it to *expand*. So you can make as tight a seal as you want . . . first Teflon-to-metal, then metal-to-metal.

This extra degree of control insures maximum dependability over long periods of use or disuse . . . under a wide range of temperatures and pressures . . . with all pipeline ladings.

The exclusive W-K-M Expanding Gate is a big reason why W-K-M pipeline valves outnumber any other valve in mainline service. Specify them.

Exclusive expanding gate is full-bore, seals positively upstream and down.

Sizes: 2" through 12" at leading supply stores; sizes through 36" on special order.

Pressures: ASA 300 through ASA 1500 lb.

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